DEPARTMENT OF THE ARMY
INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, U.S. ARMY GARRISON, FORT WAINWRIGHT
1046 MARKS ROAD
FORT WAINWRIGHT, ALASKA 99703

DEC 02 2016

Directorate of Public Works

SUBJECT: Submission of the US Army Garrison Fort Wainwright, Alaska's (USAG FWA) Fourth Five-Year Review Report

Ms. Shirley Bilbrey
Director, Region 10
US Environmental Protection Agency
Office of Environmental Clean-up
1200 Sixth Avenue
Seattle, WA 98101-3140

Dear Ms. Bilbrey,

Please find attached the USAG FWA Fourth Five-Year Review Report. The Army has made the necessary revisions to the USAG FWA Fourth Five-Year Review Report that incorporates the text changes and additional data analyses identified during the comment resolution telecoms with representatives from the U.S. Environmental Protection Agency Region 10 (EPA) and the Alaska Department of Environmental Conservation (ADEC).

Copies of this letter and the USAG FWA Fourth Five-Year Review Report will be furnished to the U.S. Army Environmental Command, the U.S. EPA Region 10 Alaska Operations Office Remedial Project Manager and the ADEC Remedial Project Manager.

The USAG FWA appreciates your support of our Environmental programs and looks forward to working with you in the future.

If you have any other questions or comments, please contact Mr. Joseph Malen, USAG FWA Remedial Project Manager at (907) 361-4512 or joseph.s.malen.civ@mail.mil.

Sincerely,

Sean C. Williams
Colonel, US Army
Commanding

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Fourth Five-Year Review Report for

FORT WAINWRIGHT
FAIRBANKS, ALASKA
USEPA ID AK6210022426

Prepared For:
U.S. Army Garrison, Fort Wainwright
1046 Marks Road #6000
Fort Wainwright, Alaska 99703-6000

November 2016

Prepared By:
U.S. Army Corps of Engineers
Buffalo District
1776 Niagara Street
Buffalo, New York 14207

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Fourth Five-Year Review Report for

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Approved by: **Date:**

2 DEC 2016

Sean C. Williams
Colonel, U.S. Army
Commanding

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TABLE OF CONTENTS

TABLES

ATTACHMENTS

FIGURES

ACRONYMS AND ABBREVIATIONS

2-PTY	Two-Party
AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AOC	Area of Concern
ARAR	applicable or relevant and appropriate requirement
AS	air sparge
ASTs	above ground storage tanks
AWQS	Alaska Water Quality Standards
bgs	below ground surface
BHTF	Birch Hill Tank Farm
BTEX	benzene, toluene, ethylbenzene, and xylenes
CANOL	Canadian Oil Pipeline
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLOSES	Cleanup Operations and Site Exit Strategy
COCs	contaminants of concern
CRAAP	Chena River Aquatic Assessment Program
CRREL	U.S. Army Cold Regions Research and Engineering Laboratory
CY	cubic yard
DCA	dichloroethane
DCE	dichloroethene
DO	dissolved oxygen
DoD	Department of Defense
DPW	Directorate of Public Works
DRMO	Defense Reutilization Maintenance Operation
DRO	diesel range organics
EDB	dibromoethane
EQFS	East Quartermaster’s Fueling System
ESD	Explanation of Significant Differences
E&E	Ecology and Environment, Inc.
FEP	Fairbanks-Eielson Pipeline
FES	Fairbanks Environmental Services, Inc.
FFA	Federal Facility Agreement between USEPA, FWA, and ADEC

FFCA	Federal Facility Compliance Agreement
FS	feasibility study
Ft	foot (feet)
FWA	Fort Wainwright Alaska
GIS	geographic information system
GRO	gasoline range organics
HLA	Hardy Lawson Associates
IC	institutional control
iRACR	interim remedial action completion report
IRIS	Integrated Risk Information System
IRP	Installation Restoration Program
ISCO	in-situ chemical oxidation
ISCR	in-situ chemical reduction
Jacobs	Jacobs Engineering Group, Inc.
LNAPL	light non-aqueous phase liquid
LTMO	long-term monitoring optimization
LUC	land use control
MAROS	Monitoring and Remediation Optimization System
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
MEC	Munitions and Explosives of Concern
MNA	monitored natural attenuation
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
ND	not detected
NFA	no further action
NPL	National Priorities List
OB/OD	open burning/open detonation
OM&M	operation, maintenance, and monitoring
ORC	oxygen releasing compound
ORP	oxidation reduction potential
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PCA	tetrachloroethane

PCE	tetrachloroethene
PFC	perfluorooctane
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanoic sulfate
PMP	Performance Monitoring Plan
POL	petroleum, oil, lubricant
PSE	preliminary source evaluation
RAO	remedial action objective
RACR	remedial action completion report
RBC	risk-based concentration
RCRA	Resource, Conservation, Recovery Act
RFA	RCRA Facility Assessment
RI	remedial investigation
RI/FS	remedial investigation/feasibility study
ROD	record of decision
ROLF	Railcar Off-Loading Facility
RPM	Remedial Project Manager
RRO	residual range organics
SDWA	Safe Drinking Water Act
SOP	standard operating procedure
SVE	soil vapor extraction
SVOC	semi-volatile organic compound
TAH	total aromatic hydrocarbons
TAqH	total aqueous hydrocarbons
TCA	trichloroethane
TCE	trichloroethene
TCP	trichloropropane
TMB	trimethylbenzenes
USACE	U.S. Army Corps of Engineers
USAEC	U.S. Army Environmental Command
USEPA	US Environmental Protection Agency
UST	underground storage tank
UVOST	ultra violet light optical screening tool

UXO	unexploded ordnance
VISL	vapor intrusion screening level
VOC	volatile organic compound
WQFS	West Quartermaster's Fueling System
mV	millivolts
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
µg/L	micrograms per liter

EXECUTIVE SUMMARY

This is the fourth five-year review of remedial actions taken at operable units (OU) 1 through 5 on Fort Wainwright, Alaska (FWA):

- OU-1 801 Drum Burial Site
- OU-2 Building 1168 Leach Well
- OU-2 Defense Reutilization Maintenance Operation Yard
- OU-3 Remedial Area 1B (Birch Hill Tank Farm)
- OU-3 Remedial Area 2 (Valve Pits and Railcar Off-Loading Facility)
- OU-3 Remedial Area 3 (Fairbanks-Eielson Pipeline Mileposts 2.7 and 3.0)
- OU-4 Landfill
- OU-4 Coal Storage Yard
- OU-5 West Quartermaster's Fueling System
- OU-5 East Quartermaster's Fueling System
- OU-5 Remedial Area 1A (Birch Hill Tank Farm Above Ground Storage Tanks)

This is the first five-year review of remedial actions taken at OU-6 (Former Communications Site) on FWA.

The purpose of this review is to determine if remedial actions implemented at these sites are and will continue to be protective of human health and the environment.

The U.S. Army prepared this review consistent with applicable requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121 for National Priority List sites and the National Oil and Hazardous Substances Pollution Contingency Plan. This five-year review is required because hazardous substances remain at the sites at levels that do not allow for unlimited use and unrestricted exposure. The methods, findings, and conclusions of the review, identified issues, and recommendations are documented in this report. The triggering action for this five-year review was the completion of the third five-year review report on September 29, 2011.

Fort Wainwright

As described in the Federal Facility Agreement (FFA), FWA is located within the Fairbanks North Star Borough in interior Alaska and occupies approximately 911,604 acres on the east side of Fairbanks. The Fairbanks North Star Borough is lightly populated with several scattered developments. The City of Fairbanks (population 35,000) is on the western boundary of FWA.

The installation consists of three primary areas:

- The main post two miles east of Fairbanks between the Chena and Tanana Rivers; it consists of a cantonment area, a small arms range complex, and a close in range complex.
- The Tanana Flats training area across the Tanana River from the main post.
- The Yukon Training Area 16 miles east-southeast of Fairbanks, adjacent to Eielson Air Force Base.

The U.S. Environmental Protection Agency (USEPA) placed FWA on the National Priorities List in August 1990. The USEPA, Alaska Department of Environmental Conservation (ADEC), and the U.S. Army negotiated a FFA in March 1992. It was amended in 2007 to add OU6 and provide a mechanism to add newly discovered source areas. The FFA ensures that environmental impacts associated with past practices at FWA are investigated and remedial actions are completed to protect human health and the environment. It sets deadlines, objectives, responsibilities, and procedural framework for implementing restoration activities at FWA.

OU-1 801 Drum Burial Site

The OU-1 801 Drum Burial site is an approximate 20 acre area that was used as a drum storage and disposal area. The drums contained diesel fuel, gasoline, jet fuel, solvents, asphalt, pesticides, and lubricants. Volatile organic compounds (VOCs), pesticides, and metals were present in soil, groundwater, and sediments of the Chena River. Metals were present in Chena River water samples.

The remedy consisted of drum and soil removal, natural attenuation of groundwater with long term monitoring/evaluation, institutional controls (ICs), and a contingent remedy consisting of air sparging/soil vapor extraction (AS/SVE). Soil and drum removal actions were conducted between 1992 and 1996. The contingent remedy was not implemented because contaminant concentrations in groundwater did not increase and the contaminant plume did not expand. ICs have been implemented and groundwater monitoring is ongoing. The ICs include restrictions on site access, construction, and well installation as long as hazardous substances remain at the site at levels that preclude unlimited use and unrestricted exposure.

OU-2 Building 1168 Leach Well

The OU-2 Building 1168 Leach Well was used from the 1950s to 1997. It received liquids collected in floor drains within Building 1168, which was for vehicle storage, as a vehicle shop, and as a petroleum, oil, and lubricant laboratory. Hydrocarbon and chlorinated solvent contamination was present in soil and groundwater.

The remedy consisted of operating an AS/SVE system, natural attenuation of groundwater with long term monitoring/evaluation, and ICs. The AS/SVE system was installed in 1994 and operated until 1998, when it was shut down. ICs have been implemented and groundwater monitoring is ongoing. The ICs include restrictions on site access, construction, and well installation as long as hazardous substances remain at the site at levels that preclude unlimited use and unrestricted exposure.

OU-2 Defense Reutilization Maintenance Operation Yard

The OU-2 Defense Reutilization Maintenance Operation (DRMO) Yard is a 25 acre site that was used to store obsolete, surplus, and unserviceable equipment. It was also used as a hazardous material transfer point for FWA and other Department of Defense facilities. It consists of six subareas. Two of these areas (DRMO-1 and DRMO-4) are being remediated under CERCLA and are included in this five-year review. Both subareas encompass different sections of the DRMO Yard. Petroleum hydrocarbons and chlorinated solvents were present in soil and groundwater.

The remedy consisted of operating an AS/SVE system at DRMO-1, natural attenuation of groundwater with long term monitoring/evaluation, and ICs at DRMO-1 and DRMO-4. The AS/SVE system was installed in 1997 and operated until 2005, when it was shut down. ICs have been implemented and groundwater monitoring is ongoing. The ICs include restrictions on site access, construction, and well installation as long as hazardous substances remain at the sites at levels that preclude unlimited use and unrestricted exposure. Additional ICs include a limitation on refilling the DRMO Yard fire suppression water tank from the existing potable water supply well until state and federal maximum contaminant levels are met (except in emergency situations).

OU-3 Remedial Area 1B (Birch Hill Tank Farm)

OU-3 Remedial Area 1B consists of seven subareas, of which four are currently active: Former Building 1173, Truck Fill Stand, Thaw Channel, and Birch Hill Tank Farm (BHTF) Product Recovery System. The other three subareas were granted no further action status in 1996.

BHTF was constructed in 1943 as part of the Canadian Oil Pipeline project. It included fourteen 10,000 barrel and two 25,000 barrel above ground storage tanks (ASTs) that were used for JP-4, mogas, and diesel fuels. The site was contaminated with free product (weathered gasoline) on the water table, dissolved hydrocarbons and 1,2-dichloroethane (DCA) in groundwater, and VOCs and petroleum compounds in soil.

The remedy consisted of operating AS/SVE systems, a dual-phase product recovery system, natural attenuation of groundwater with long term monitoring/evaluation, and ICs. The AS/SVE systems operated between 1996 and 2005. The dual phase recovery system was installed in 1998 and operated until 2003. ICs have been implemented and groundwater monitoring is ongoing. The ICs include restrictions on site access, construction, and well installation as long as hazardous substances remain at the sites at levels that preclude unlimited use and unrestricted exposure.

OU-3 Remedial Area 2 (Valve Pits and Railcar Off-Loading Facility)

OU-3 Remedial Area 2 occupies 40 acres. It was used as a rail car off-loading and fuel distribution facility. It consists of six subareas: Valve Pit A, Valve Pit B, Valve Pit C, a Central Header, Former Building 1144, and an Eight Car Header. Groundwater and soil contamination were caused by fuel and fuel additive storage, handling, and transfer activities. Soil and groundwater at the sites were contaminated with petroleum hydrocarbons.

The remedy consisted of operating AS/SVE systems, natural attenuation of groundwater with long term monitoring/evaluation, and ICs. The AS/SVE systems were installed in 1996 and operated until 2012. ICs have been implemented and groundwater monitoring is ongoing. The ICs include restrictions on site access, construction, and well installation as long as hazardous substances remain at the sites at levels that preclude unlimited use and unrestricted exposure.

OU-3 Remedial Area 3 (Fairbanks-Eielson Pipeline Mileposts 2.7 and 3.0)

OU-3 Remedial Area 3 consists of two source areas along the Fairbanks-Eielson Pipeline (FEP) at Milepost 2.7 and Milepost 3.0. A third site, Milepost 15.75, was granted no further action status in 2012 and is not included in this five-year review. Petroleum hydrocarbon contamination of soil and groundwater was identified at Milepost 2.7 and Milepost 3.0.

The remedy consisted of operating AS/SVE systems at each site, injecting an oxygen-releasing compound into groundwater during a treatability study, natural attenuation of groundwater with long term monitoring/evaluation, and ICs. AS/SVE and oxygen releasing compound treatability studies were performed in 1996. Both technologies were not considered viable due to low soil permeability. An Explanation of Significant Differences was prepared in 2002 to change the remedial strategy to excavation of contaminated soil, *ex situ* treatment via AS/SVE and additional monitoring requirements. A data gap analysis is planned for these areas to verify the source of groundwater contamination and to recommend future actions. ICs have been implemented and groundwater monitoring is ongoing. The ICs include restrictions on site access, construction, and well installation as long as hazardous substances remain at the sites at levels that preclude unlimited use and unrestricted exposure.

OU-4 Landfill

The OU-4 Landfill Source Area occupies approximately 14 acres. It was used for disposal of domestic and commercial refuse, ash, asbestos, incinerator residue, and construction and demolition waste from the early 1950s to the early 1960s. A limited area of petroleum contaminated surface soil was present at one location. Groundwater was contaminated by petroleum hydrocarbons and chlorinated solvents.

The remedy consisted of installing a landfill cap, natural attenuation of groundwater with long term monitoring/evaluation, and ICs. A contingent remedy, consisting of a methane gas collection system, was also identified in the Record of Decision (ROD). It was subsequently determined to be unnecessary and not installed. ICs have been implemented and groundwater monitoring is ongoing. The ICs include restrictions on site access, construction, and well installation as long as hazardous substances remain at the site at levels that preclude unlimited use and unrestricted exposure.

OU-4 Coal Storage Yard

The OU-4 Coal Storage Yard is an approximately 800 feet by 300 feet (ft) area that was used for coal storage for a FWA cogeneration power plant. The pile was sprayed with waste petroleum products and waste solvents from the 1960s to 1993 to increase the thermal content of the coal. The site is still used for coal storage. Groundwater was contaminated by petroleum hydrocarbons, chlorinated solvents, and bis(2-ethylhexyl)phthalate.

The remedy consisted of operating an AS/SVE system, natural attenuation of groundwater with long term monitoring/evaluation, and ICs. The AS/SVE system was installed in 1997 and operated until 2000. Groundwater monitoring has been discontinued because COCs were not detected in groundwater above the cleanup goals. ICs have been implemented, they include restrictions on site access, construction, and well installation as long as hazardous substances remain at the site at levels that preclude unlimited use and unrestricted exposure.

OU-5 West Quartermaster's Fueling System

The OU-5 West Quartermaster's Fueling System (WQFS) consists of four subareas, WQFS1, WQFS2, WQFS3, and WQFS4 that encompass approximately 50 acres. It was used for vehicle and aircraft maintenance operations that involved the use and disposal of solvents and other cleaning compounds. The site also included storage tanks (underground and above ground), a pump house, fueling islands, and fuel piping (above ground and underground). Buried drums were encountered at the site. Groundwater, surface water in the Chena River, and soil were contaminated by petroleum hydrocarbons. 1,2-DCA was also identified in groundwater.

The remedy consisted of operating AS/SVE systems, natural attenuation of groundwater with long term monitoring/evaluation, and ICs. Three AS/SVE systems were installed in 1997 and 1998 and decommissioned in 2011 and 2013. A fourth AS/SVE system was operated between

2001 and 2003. A boom was installed in the Chena River in 1998 to remove sheen from the water. It is deployed annually from May to October. Abandoned and buried fuel lines were cleaned, emptied, and abandoned in 2000. Groundwater monitoring is ongoing and ICs have been implemented. The ICs include restrictions on site access, construction, and well installation as long as hazardous substances remain at the sites at levels that preclude unlimited use and unrestricted exposure.

OU-5 East Quartermaster's Fueling System

The OU-5 East Quartermasters Fueling System (EQFS) covers approximately 40 acres. It was used for vehicle storage and maintenance, dry cleaning, fuels testing, refueling, pesticide storage and mixing, and waste storage. The site included storage tanks (underground and above ground), a pump house, fueling islands, and a fuel pipeline. Groundwater, surface water in the Chena River, and soil were contaminated by petroleum hydrocarbons. 1,2-Dichloroethane and bis(2-chlorethyl)ether were identified in groundwater.

The remedy consisted of operating an AS/SVE system, natural attenuation of groundwater with long term monitoring/evaluation, and ICs. The AS/SVE system was operated from 1994 to 2005. ICs have been implemented and groundwater monitoring is ongoing. The ICs include restrictions on site access, construction, and well installation as long as hazardous substances remain at the site at levels that preclude unlimited use and unrestricted exposure.

OU-5 Remedial Area 1A (Birch Hill Tank Farm Above Ground Storage Tanks)

OU-5 Remedial Area 1A consists of petroleum and lead-contaminated soil surrounding above ground storage tanks on the BHTF. The site contained fourteen 10,000 barrel and two 25,000 barrel ASTs, underground pipes, pump houses, a manifold building, and a truck fill stand. The facility was used for storage of diesel fuel, jet fuel, and gasoline (leaded and unleaded). It covers approximately 110 acres.

Petroleum and lead-contaminated soil was caused by sludge in the bottom of the tanks, thread lubricant, and leaded paint chips from the tanks. The remedy consists of ICs to restrict access and land use. The ASTs were removed in 2015 and excavation of contaminated soil is planned for 2016 pursuant to a 2-Party Agreement between the U.S. Army and ADEC (not under the OU-5 CERCLA remedy). ICs have been implemented. They include restrictions on site access, construction, and well installation as long as hazardous substances remain at the site at levels that preclude unlimited use and unrestricted exposure.

OU-5 Open Burn Open Detonation (OB/OD) Area

The OB/OD Area was used historically for open burning and open detonation of explosives on FWA from as early as the mid-1960s until as late as the mid-1980s. It is located within an active small-arms impact range on FWA, approximately 1,000 ft north of the Tanana River and 1,500 ft south of a flood control dike. The site is situated along the east side of a gravel water-filled borrow pit. It is bounded to the north and east by gravel berms. The bermed area comprising the OB/OD site measures approximately 150 ft by 450 ft. An OB/OD pad reportedly was used by the U.S. Army and the U.S. Air Force for disposing of unexploded ordnance (UXO), unused propellants (black powder), rocket motors, small-arms ammunition, and other hazardous materials.

The OB/OD was included in OU-5 under the FFA, was also designated as a RCRA-regulated unit, and was granted deferred closure under Title 40, part 265 of the Code of Federal

Regulations (CFR) since this site is located within the active small-arms impact range on FWA. As described in the ROD, final closure will occur under a 1991 Federal Facility Compliance Agreement (FFCA) and RCRA, but evaluation of the decision to delay closure will be reviewed during each five year review.

The ecological and human health risk assessments completed during a remedial investigation indicated that the risks associated with the site are very low, and therefore, the site was determined to require no further action under CERCLA and RCRA Corrective Action. However, because of concerns about potential human exposure to unexploded ordnance associated with the operational range and the deferred RCRA closure, the U.S. Army's ICs that provide monitoring and control of access to the site were required to remain in place.

OU-6 Former Communications Site

The OU-6 Former Communications Site covers approximately 54 acres and contains military housing units known as the Tanana Trails Family Housing Development (formerly known as Taku Gardens Family Housing Development). It previously contained or was used for barracks, company headquarters, communications and radar systems, a salvage/reclamation yard, debris disposal, drum stockpiles, firefighter training, a Post Exchange Service Station (gas station), a concrete batch plant, and possible ammunition storage. Previous site activities included the dumping of solid waste and debris into a former meander channel of the Chena River (Hoppe's Slough).

Soil and groundwater contamination were identified during construction of the housing development and remedial investigation activities. Soil contamination consisted of petroleum, oil, and lubricants, polychlorinated biphenyls (PCBs), volatile organic, semi-volatile organic, and explosive compounds, pesticides, and herbicides. Groundwater was contaminated by petroleum, oil, and lubricants and VOCs. Five groundwater contaminant plumes were identified. Several removal actions were conducted after the risk assessment was completed and prior to the OU-6 ROD. They resulted in the removal and off-site disposal of PCB-contaminated soil (3,368 cubic yards [CY]), pesticide-contaminated soil (66 CY), petroleum/solvent-contaminated soil (3,354 CY), 2,934 items classified as munitions-related debris, and 1,061 drums (all but eight were empty and crushed).

The ROD was signed in January 2014. The remedy consists of: 1) implementing ICs that prohibit soil disturbing activities greater than 6 inches without prior approval, prohibit the use of or access to groundwater beneath the site, and prohibit damage or defacement of monitoring wells, and 2) groundwater monitoring to assess the progress of natural attenuation of the contaminants and to ensure that contamination is not migrating towards FWA drinking water supply wells. A land use control/IC site inspection has been conducted since the ROD was signed.

Site Inspections, Interviews, and Public Notice

Five-year review site inspections were performed on August 11, 2015. Interviews were conducted with FWA Directorate of Public Works personnel and U.S. Army Corps of Engineers, Alaska District personnel. Interviews with USEPA and ADEC personnel were completed in July, 2016. A public notice announcing the five-year review was published in the Alaska Post on April 8, 2016 and in the Fairbanks Daily Miner on June 14, 2016.

Protectiveness Statements, Issues, and Recommendations

OU-1

The remedy at OU-1 currently protects human health and the environment because:

- Contaminant source removal (drums and contaminated soil) was completed.
- Migration of contaminants of concern (COCs) in groundwater to the Chena River and downgradient drinking water wells is not occurring based on sampling results that indicate the plume is stable.
- Based on groundwater data and a comparison of groundwater quality to calculated USEPA vapor intrusion screening levels (VISLs), the vapor intrusion exposure pathway is incomplete at the 801 Drum Burial Site.
- ICs are in place to ensure that groundwater will not be used until cleanup goals are attained and to assure that exposure to any contaminated soil at the site will not occur.

However, in order for the remedy to be protective in the long-term, the following actions need to be taken to ensure protectiveness:

- Collect groundwater samples from monitoring wells AP-6326, AP-6327, AP-7162, and AP-10042 for analysis for VOCs and complete a vapor intrusion assessment.
- Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the 801 Drum Burial Site. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.

OU-2

The remedies at OU-2 currently protect human health and the environment because:

- All cleanup goals have been attained at the Building 1168 Leach Well site, although petroleum contamination persists at the site.
- Migration of COCs in groundwater from the DRMO-1 and DRMO-4 source areas has been reduced by the remedial actions.
- ICs are in place to ensure that groundwater containing COCs will not be used.

However, in order for the remedy to be protective in the long-term, the following action needs to be taken to ensure protectiveness:

- Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the Building 1168 Leach Well site and DRMO Yard. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.

OU-3

The remedies at OU-3 currently protect human health and the environment because:

- Further migration of contaminated groundwater has been reduced by the remedial actions and natural attenuation.
- ICs are in place to ensure that groundwater containing COCs will not be used.
- Off-post risks associated with the consumption of contaminated groundwater at Remedial Area 1B are mitigated by attenuation of COCs in the alluvial aquifer.

However, in order for the remedies to be protective in the long-term, the following actions need to be taken:

- Re-establish the cleanup goals for 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene in groundwater using either of the following methods: 1) update the risk-based concentrations by including the inhalation pathway and using information from a new USEPA Integrated Risk Information System toxicity assessment, or 2) adopt the cleanup goals established in 18 AAC 75.
- Perform a data gap investigation at Remedial Area 1B and the Mileposts 2.7 and 3.0 sites and recommend a future course of action for the sites. (This activity is currently under contract with the U.S. Army.).
- Conduct an investigation to evaluate if there are any previously undiscovered source areas at the Remedial Area 2 (Valve Pits and ROLF).

OU-4

The remedies at OU-4 currently protect human health and the environment because:

- All RAOs have been attained at the Coal Storage Yard.
- Further migration of contaminated groundwater from the Landfill Source Area has been reduced by the implemented remedy and natural attenuation.
- ICs are in place at the Landfill Source Area to ensure that contaminated groundwater will not be used until the cleanup goals are attained.

However, in order for the remedies to be protective in the future, the following action needs to be taken to ensure protectiveness:

- Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the Landfill. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.

OU-5

The remedies at OU-5 currently protect human health and the environment because:

- Initial remedial responses were performed at WQFS/EQFS and AS/SVE systems were installed and operated in accordance with the ROD. The treatment systems have recovered significant mass and reduced or prevented further migration of contaminated groundwater to downgradient areas and the Chena River.
- Natural attenuation is an active process that has reduced or prevented further migration of contaminated groundwater to downgradient areas and the Chena River from the WQFS/EQFS.
- The Chena River Aquatic Assessment Program did not identify adverse impacts associated with the WQFS/EQFS to benthic communities in the river.
- Occurrences of sheen in the Chena River have decreased.
- ICs are in place at the WQFS/EQFS to ensure that groundwater containing contaminants above Safe Drinking Water Act (SDWA) maximum contaminant levels (MCLs), non-zero maximum contaminant level goals (MCLGs), or relevant Alaska Water Quality Standards (AWQS) (fresh water use criteria) will not be used until the cleanup goals are attained.

- ICs are in place at Remedial Area 1A to limit human and terrestrial receptor exposure to lead contaminated soil.
- The OB/OD IC components have been improved since trespassers were identified on a site located 1,000 ft from the OB/OD. Improvements include increased frequency of inspections and access controls.
- There is no evidence of unauthorized installation or use of groundwater wells, no soil disturbing activities, and warning signs are intact at Remedial Area 1A and the OB/OD Area.

However, in order for the remedies to be protective in the long-term, the following actions need to be taken to ensure protectiveness:

- Conduct an investigation and determine if there are any previously undiscovered source areas at the WQFS.
- Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the OU-5 WQFS or EQFS. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.

OU-6

The remedy at OU-6 is protective of human health and the environment because:

- ICs are in place to ensure that human exposure to contaminated soil and groundwater will not occur.
- There is no evidence of unauthorized installation or use of groundwater wells.
- Groundwater quality data will be used to assess the performance of the OU-6 remedy in the future.

Issues and Recommendations

Issues that affect protectiveness of the remedies and recommendations to address them are identified in Section 6, Table 6-1.

Several concerns have been identified that do not affect the protectiveness of the remedies. These concerns and corresponding recommendations are provided in Section 6, Table 6-2.

FIVE YEAR REVIEW SUMMARY FORM

<table>
<tr><th colspan="3">SITE IDENTIFICATION</th></tr>
<tr><td colspan="3">Site Name: Fort Wainwright Alaska (FWA)</td></tr>
<tr><td colspan="3">EPA ID: AK6210022426</td></tr>
<tr><td>Region: X</td><td>State: AK</td><td>City/County: Fairbanks/Fairbanks North Star Borough</td></tr>
<tr><th colspan="3">SITE STATUS</th></tr>
<tr><td colspan="3">NPL Status: Final</td></tr>
<tr><td colspan="2">Multiple OUs? Yes
OU-1 801 Drum Burial Site
OU-2 Building 1168 Leach Well
OU-2 DRMO Yard
OU-3 Remedial Area 1B (BHTF)
OU-3 Remedial Area 2 (Valve Pits and Rail Off Loading Facility [ROLF])
OU-3 Remedial Area 3 (FEP Mileposts 2.7 and 3.0)
OU-4 Landfill
OU-4 Coal Storage Yard
OU-5 WQFS
OU-5 EQFS
OU-5 Remedial Area 1A (BHTF ASTs)
OU-5 OB/OD Area
OU-6 Former Communications Site</td><td>Has the site achieved construction completion?
No</td></tr>
<tr><th colspan="3">REVIEW STATUS</th></tr>
<tr><td colspan="3">Lead agency: Other Federal Agency
If “Other Federal Agency” was selected above, enter Agency name: U.S. Army</td></tr>
<tr><td colspan="3">Author name (Federal or State Project Manager): Prepared by U.S. Army Corps of Engineers for U.S. Army Environmental Command and USAG - FWA</td></tr>
<tr><td colspan="3">Author affiliation: U.S. Army Corps of Engineers</td></tr>
<tr><td colspan="3">Review Period: August 2015 – November 2016</td></tr>
<tr><td colspan="3">Date of site inspection: August 11, 2015</td></tr>
<tr><td colspan="3">Type of review: Statutory</td></tr>
<tr><td colspan="3">Review number: 4</td></tr>
<tr><td colspan="3">Triggering action date: September 29, 2011</td></tr>
</table>

<table>
<tr><td colspan="5">Due date (five years after triggering action date): September 29, 2016</td></tr>
<tr><th colspan="5">Issues/Recommendations</th></tr>
<tr><td colspan="5">AOC(s) without Issues/Recommendations Identified in the Five-Year Review:</td></tr>
<tr><td colspan="5">OU-4 Coal Storage Yard, OU-5 Remedial Area 1A (BHTF ASTs), OU-5 OB/OD Area, and OU-6 Former Communications Site</td></tr>
<tr><td colspan="5">Issues and Recommendations Identified in the Five-Year Review:</td></tr>
<tr><td rowspan="3">AOC(s):
OU-1 (Drum Burial Site)</td><td colspan="4">Issue Category: Monitoring</td></tr>
<tr><td colspan="4">Issue: Under agreement among the remedial project managers (RPMs), data was not collected from monitoring wells located between currently monitored points and the 801 Military Housing Area for inclusion in the five-year review. Data from these wells was not available for use in the vapor intrusion assessment at OU-1.</td></tr>
<tr><td colspan="4">Recommendation: Collect groundwater samples from monitoring wells AP-6326, AP-6327, AP-7162, and AP-10042 for analysis for VOCs and complete a vapor intrusion assessment.</td></tr>
<tr><td>Affect Current Protectiveness</td><td>Affect Future Protectiveness</td><td>Implementing Party</td><td>Oversight Party</td><td>Milestone Date</td></tr>
<tr><td>No</td><td>Yes</td><td>Federal Facility</td><td>USEPA</td><td>September 2018</td></tr>
<tr><td rowspan="3">AOC(s):
OU-1 (Drum Burial Site)</td><td colspan="4">Issue Category: Monitoring</td></tr>
<tr><td colspan="4">Issue: An assessment for 1,4-dioxane has not been performed at the 801 Drum Burial Site.</td></tr>
<tr><td colspan="4">Recommendation: Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the 801 Drum Burial Site. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.</td></tr>
<tr><td>Affect Current Protectiveness</td><td>Affect Future Protectiveness</td><td>Implementing Party</td><td>Oversight Party</td><td>Milestone Date</td></tr>
<tr><td>No</td><td>Yes</td><td>Federal Facility</td><td>USEPA</td><td>September 2018</td></tr>
<tr><td rowspan="3">AOC(s):
OU-2 (Building 1168 Leach Well and DRMO Yard)</td><td colspan="4">Issue Category: Monitoring</td></tr>
<tr><td colspan="4">Issue: An assessment for 1,4-dioxane has not been performed at the 1168 Leach Well site and DRMO Yard.</td></tr>
<tr><td colspan="4">Recommendation: Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the Building 1168 Leach Well site and DRMO sites. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.</td></tr>
</table>

<table>
<tr><th>Affect Current Protectiveness</th><th>Affect Future Protectiveness</th><th>Implementing Party</th><th>Oversight Party</th><th>Milestone Date</th></tr>
<tr><td>No</td><td>Yes</td><td>Federal Facility</td><td>USEPA</td><td>September 2018</td></tr>
<tr><td rowspan="3">AOC(s):
OU-3 Remedial Area 1B (BHTF), Remedial Area 2 (Valve Pits and ROLF), and Remedial Area 3 (FEP Mileposts 2.7 and 3.0)</td><td colspan="4">Issue Category: Cleanup goals</td></tr>
<tr><td colspan="4">Issue: The risk-based cleanup goals for trimethylbenzenes (TMBs) presented in the 2002 Explanation of Significant Differences are no longer valid.</td></tr>
<tr><td colspan="4">Recommendation: Re-evaluate and update the cleanup goals for 1,2,4-TMB and 1,3,5-TMB in groundwater.</td></tr>
<tr><th>Affect Current Protectiveness</th><th>Affect Future Protectiveness</th><th>Implementing Party</th><th>Oversight Party</th><th>Milestone Date</th></tr>
<tr><td>No</td><td>Yes</td><td>Federal Facility</td><td>USEPA</td><td>September 2018</td></tr>
<tr><td rowspan="3">OU-3 Remedial Area 1B (BHTF - GW)</td><td colspan="4">Issue Category: Remedy Performance</td></tr>
<tr><td colspan="4">Issue: The benzene and 1,2-DCA concentrations continue to exceed cleanup goals and exhibit increasing trends in some monitoring locations.</td></tr>
<tr><td colspan="4">Recommendation: Perform a data gap investigation and recommend a future course of action for Remedial Area 1B.</td></tr>
<tr><th>Affect Current Protectiveness</th><th>Affect Future Protectiveness</th><th>Implementing Party</th><th>Oversight Party</th><th>Milestone Date</th></tr>
<tr><td>No</td><td>Yes</td><td>Federal Facility</td><td>USEPA</td><td>September 2018</td></tr>
<tr><td rowspan="3">OU-3 Remedial Area 2 (Valve Pits and ROLF)</td><td colspan="4">Issue Category: Remedy Performance</td></tr>
<tr><td colspan="4">Issue: The historical decommissioning of infrastructure may have resulted in the abandonment of pipeline with impacts at Remedial Area 2.</td></tr>
<tr><td colspan="4">Recommendation: Conduct an investigation to evaluate whether there are any previously undiscovered source areas at the Remedial Area 2 (Valve Pits and ROLF).</td></tr>
<tr><th>Affect Current Protectiveness</th><th>Affect Future Protectiveness</th><th>Implementing Party</th><th>Oversight Party</th><th>Milestone Date</th></tr>
<tr><td>No</td><td>Yes</td><td>Federal Facility</td><td>USEPA</td><td>September 2018</td></tr>
<tr><td rowspan="2">OU-3 Remedial Area 3 (FEP Mileposts 2.7 & 3.0)</td><td colspan="4">Issue Category: Remedy Performance</td></tr>
<tr><td colspan="4">Issue: The concentrations of benzene remain high and exhibit increasing trends in several wells. Analysis has shown that groundwater cleanup goals will not be achieved for these areas within a reasonable period of time.</td></tr>
</table>

	Recommendation: Perform a data gap investigation (currently under contract and being performed) and recommend a future course of action for the FEP Milepost sites.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	USEPA	September 2018
OU-4 Landfill	**Issue Category:** Monitoring			
	Issue: An assessment for 1,4-dioxane has not been performed at the Landfill.			
	Recommendation: Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the Landfill. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	USEPA	September 2018
OU-5 WQFS	**Issue Category:** Remedy Performance			
	Issue: The historical decommissioning of infrastructure may have resulted in the abandonment of pipeline with impacts at the WQFS.			
	Recommendation: Conduct an investigation to evaluate if there are any previously undiscovered source areas at the WQFS.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	USEPA	September 2018
OU-5 WQFS and EQFS	**Issue Category:** Monitoring			
	Issue: An assessment for 1,4-dioxane has not been performed at OU-5 WQFS or EQFS.			
	Recommendation: Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the OU-5 WQFS or EQFS. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	USEPA	September 2018

Protectiveness Statement(s)		
AOC: OU-4 Coal Storage Yard, OU-5 Remedial Area 1A (BHTF ASTs), OU-5 OB/OD, and OU-6 Former Communications Site	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):*
AOC: OU-1 801 Drum Burial Site, OU-2 Building 1168 Leach Well, OU-2 DRMO Yard, OU-3 Remedial Area 1B (BHTF – GW), OU-3 Remedial Area 2 (Valve Pits and ROLF), OU-3 Remedial Area 3 (FEP Mileposts 2.7 & 3.0), OU-4 Landfill, OU-5 WQFS, and OU-5 EQFS	*Protectiveness Determination:* Short-Term Protective	*Addendum Due Date (if applicable):*

Protectiveness Statements:

OU-1

The remedy at OU-1 currently protects human health and the environment because:

- Contaminant source removal (drums and contaminated soil) was completed.
- Migration of COCs in groundwater to the Chena River and downgradient drinking water wells is not occurring.
- Based on groundwater data and a comparison of groundwater quality to the calculated USEPA VISLs, the vapor intrusion exposure pathway is incomplete at the 801 Drum Burial Site.
- ICs are in place to ensure that groundwater will not be used until cleanup goals are attained and to assure that exposure to any contaminated soil at the site will not occur.

However, in order for the remedy to be protective in the long-term, the following actions need to be taken to ensure protectiveness:

- Collect groundwater samples from monitoring wells AP-6326, AP-6327, AP-7162, and AP-10042 for analysis for VOCs and complete a vapor intrusion assessment.
- Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the 801 Drum Burial Site. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.

OU-2

The remedies at OU-2 currently protect human health and the environment because:

- All cleanup goals have been attained at the Building 1168 Leach Well site, although petroleum contamination persists at the site.
- Migration of COCs in groundwater from the DRMO-1 and DRMO-4 source areas has been reduced by the remedial actions.
- ICs are in place to ensure that groundwater containing COCs will not be used.

However, in order for the remedies to be protective in the long-term, the following action needs to be taken to ensure protectiveness:

- Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the Building 1168 Leach Well site and DRMO Yard. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.

OU-3

The remedies at OU-3 currently protect human health and the environment because:

- Further migration of contaminated groundwater has been reduced by the remedial actions and natural attenuation.
- ICs are in place to ensure that groundwater containing COCs will not be used.
- Off-post risks associated with the consumption of contaminated groundwater at Remedial Area 1B are mitigated by attenuation of COCs in the alluvial aquifer.

However, in order for the remedies to be protective in the long-term, the following actions need to be taken:

- Re-establish the cleanup goals for 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene in groundwater using either of the following methods: 1) update the risk-based concentrations by including the inhalation pathway and using information from the 2016 USEPA Integrated Risk Information System toxicity assessment or 2) adopt the cleanup goals established in 18 AAC 75.
- Perform a data gap investigation at Remedial Area 1B and the FEP Mileposts 2.7 and 3.0 sites and recommend a future course of action for the sites. (This activity is currently under contract with the U.S. Army for the Milepost sites).
- Conduct an investigation to evaluate if there are any previously undiscovered source areas at the Remedial Area 2 (Valve Pits and ROLF).

OU-4

The remedies at OU-4 currently protect human health and the environment because:

- All RAOs have been attained at the Coal Storage Yard.
- Further migration of contaminated groundwater from the Landfill Source Area has been reduced by the implemented remedy and natural attenuation.
- ICs are in place at the Landfill Source Area to ensure that contaminated groundwater will not be used until the cleanup goals are attained.

However, in order for the remedies to be protective in the future, the following actions needs to be taken to ensure protectiveness:

- Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the Landfill. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.

OU-5

The remedies at OU-5 currently protect human health and the environment because:

- Initial remedial responses were performed at WQFS/EQFS and AS/SVE systems were installed and operated in accordance with the ROD. The treatment systems have recovered significant mass and reduced or prevented further migration of contaminated groundwater to downgradient areas and the Chena River.

- Natural attenuation is an active process that has reduced or prevented further migration of contaminated groundwater to downgradient areas and the Chena River from the WQFS/EQFS.
- The Chena River Aquatic Assessment Program did not identify adverse impacts associated with the WQFS/EQFS to benthic communities in the river.
- Occurrences of sheen in the Chena River have decreased.
- ICs are in place at the WQFS/EQFS to ensure that groundwater containing contaminants above SDWA MCLs, non-zero MCLGs, or relevant AWQS (fresh water use criteria) will not be used until the cleanup goals are attained.
- ICs are in place at Remedial Area 1A to limit human and terrestrial receptor exposure to lead contaminated soil.
- The OB/OD IC components have been improved since trespassers were identified on a site located 1,000 ft from the OB/OD. Improvements include increased frequency of inspections and access controls.
- There is no evidence of unauthorized installation or use of groundwater wells or evidence of soil disturbing activities, and warning signs are intact at Remedial Area 1A and the OB/OD area.

However, in order for the remedies to be protective in the future, the following action needs to be taken to ensure protectiveness:

- Conduct an investigation and determine if there are any previously undiscovered source areas at the WQFS.
- Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the OU-5 WQFS or EQFS. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.

OU-6

The remedy at OU-6 is protective of human health and the environment because:

- ICs are in-place to ensure that human exposure to contaminated soil and groundwater will not occur.
- There is no evidence of unauthorized installation or use of groundwater wells.
- Groundwater quality data will be used to assess the performance of the OU-6 remedy in the future.

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1.0 INTRODUCTION

This review was conducted to determine whether previous remedial actions at six operable units (OUs) on Fort Wainwright Alaska (FWA) are, and will continue to be, protective of human health and the environment. The methods, findings, and conclusions of the review are documented in this report. Also identified are issues found during the review and recommendations to address them.

The U.S. Army has prepared this five-year review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA §121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The U.S. Environmental Protection Agency (USEPA) interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

The location of FWA is illustrated on Figure 1-1. The U.S. Army conducted a review of remedial actions implemented at the following OUs, which were generally grouped by similar contaminants of concern (COCs).

OU-1 - 801 Drum Burial Site

OU-2

- Former Building 1168 Leach Well
- Defense Reutilization Maintenance Operation (DRMO) Yard

OU-3

- Remedial Area 1B Birch Hill Tank Farm (BHTF)
- Remedial Area 2 Valve Pits and Railcar Off-Loading Facility (ROLF)
- Remedial Area 3 Fairbanks-Eielson Pipeline (FEP) Mileposts 2.7 and 3.0

OU-4

- Landfill
- Coal Storage Yard

OU-5

- West Quartermaster's Fueling System (WQFS)
- East Quartermaster's Fueling System (EQFS)
- Remedial Area 1A Birch Hill Tank Farm Aboveground Storage Tanks (ASTs)
- Open Burning/Open Detonation (OB/OD) Area (no remedy selected – review of institutional controls required for unexploded ordnance)

OU-6 - Former Communications Site

This is the fourth five-year review for OU-1, OU-2, OU-3, OU-4, and OU-5, which was triggered by the completion date of the third *Five-Year Review Report for US Army Garrison, Fort Wainwright, Alaska* (U.S. Army 2011). This is the first five-year review for OU-6. The review was conducted from July 2015 to November 2016 by personnel from the U.S. Army Corps of Engineers (USACE) Buffalo District.

Previous five-year reviews of CERCLA activities at FWA were conducted in 2001 (U.S. Army 2001), 2006 (U.S. Army 2006), and 2011 (U.S. Army 2011). Updates since the last five-year review are provided on a site-by-site basis in report sections *Progress Since the Last Five-Year Review*. Table 1-1, below, lists all sites at FWA currently subject to restoration activities and whether or not they meet the requirements for inclusion in this five-year review. Review is required for OU-1 through OU-6 because the selected remedies leave hazardous substances, pollutants, or contaminants in place at levels that do not allow unlimited use and unrestricted exposure after the remedial actions are or were completed. No other five-year reviews are currently required for sites located at the FWA.

Table 1-1 Summary of Active Restoration Activities at FWA

Site ID	OU	Description	Status	Evaluated in the five-year review? (Y/N)
Installation Restoration Program Sites				
FTWW-011	4	Power Plant Coal Storage Yard (Building 3595)	1996 ROD – Remedy Implemented	Y
FTWW-038	4	Landfill Plume	1996 ROD – Remedy Implemented	Y
FTWW-047	2	DRMO Salvage Yard	1997 ROD – Remedy Implemented	Y
FTWW-055	3	Fairbanks Fuel Terminal	ROD/ESD – Remedy Selected	Y
FTWW-067	1	801 Drum Burial Site	1997 ROD, Remedy Implemented	Y
FTWW-068	5	Open Burning/Open Detonation Area	Delayed RCRA Closure	Y
FTWW-072	2	Oil Water Separator at Bldg 1168	1997 ROD – Remedy Implemented	Y
FTWW-083	3	Railroad Off Loading Facility	ROD/ESD – Remedy Implemented	Y
FTWW-084	3	FEP Milepost 2.7 and 3.0	ROD/ESD – Remedy Selected	Y
FTWW-094	5	Former Quartermaster’s Fueling System – East/West	1999 ROD –Remedy Implemented	Y
FTWW-096	5	Birch Hill Above Ground Storage Tanks	1999 ROD –Remedy Implemented	Y
FTWW-102	6	Former Communication Site/Taku Gardens	2014 ROD – Remedy Implemented	Y
N/A	7	Tanana River Site	Under Investigation	N
Petroleum Contaminated Groundwater Sites				
FTWW-050	N/A	North Post Site	2-PTY Monitoring	N
FTWW-085	N/A	UST, Bldg 5110	2-PTY Monitoring	N
FTWW-086	N/A	UST, Bldg 3562	2-PTY Under Investigation	N
FTWW-087	N/A	UST, Bldg 2111 & 2112	2-PTY Monitoring	N
FTWW-099	N/A	UST, Bldg 3564	2-PTY Monitoring	N

Site ID	OU	Description	Status	Evaluated in the five-year review? (Y/N)
FTWW-100	N/A	Building 2250 Residual POL Contamination	2-PTY Monitoring	N
FTWW-101	N/A	Neely Road POL Point Building 3570	2-PTY Monitoring	N
CC-FTRS-04	N/A	Seward Recreation Camp UST/AST Site	2-PTY Monitoring	N
CC-FTWW-02	N/A	Forward Air Refueling Point	2-PTY Monitoring	N
CC-FTWW-103	N/A	Aviation Task Force & Building 3004	2-PTY Under Investigation	N
CC-FTWW-104	N/A	Spill area south of Building 3485	2-PTY Under Investigation	N
CC-FTWW-105	N/A	336B Barracks	2-PTY Under Investigation	N
CC-FTWW-106	N/A	Pipeline Breaks	2-PTY Under Investigation	N
CC-FTWW-107	N/A	Motor Pool Building s 3492, 3494, 3496	2-PTY Under Investigation	N
CC-FTWW-108	N/A	Building 3498	2-PTY Under Investigation	N
CC-FTWW-109	N/A	Building 1054	2-PTY Under Investigation	N
CC-FTWW-110	N/A	Building 3014	2-PTY Under Investigation	N
CC-FTWW-111	N/A	Montgomery Road Extension	2-PTY Under Investigation	N
CC-FTWW-112	N/A	Sage Hill	2-PTY Under Investigation	N
CC-FTWW-113	N/A	Northern Lights Housing Area	2-PTY Under Investigation	
Military Munitions Response Program Sites				
FTWW-001-R-01	N/A	TA-105	Remedy Selection Pending	N
FTWW-002-R-01	N/A	TA-101	Remedy Selection Pending	N
FTWW-004-R-01	N/A	Arctic Survival Area – Ski Slope	Remedy Selection Pending	N
FTWW-008-R-01	N/A	Bombing From Wainwright to Greely	Under Investigation	N

2.0 SITE CHRONOLOGY

FWA was established in 1938 as a cold weather testing station. Originally known as Ladd Army Airfield, the post was used to test aircraft operations in arctic conditions. It served as supply transfer point for the United States Lend-Lease Program to the Soviet Union during World War II. In 1947 the newly formed U.S. Air Force assumed control of Ladd Army Airfield, which was redesignated as Ladd Air Force Base and became a resupply and maintenance base for Distant Early Warning sites and an experimental station in the Arctic Ocean. During the Korean conflict, the base served as part of the defense network that included Nike Hercules missile sites. FWA became the home of the 171st Infantry Brigade in 1963 and has housed various U.S. Army brigades and divisions over the years.

FWA was proposed for placement on the CERCLA National Priorities List (NPL) in July 1989 due to releases of hazardous substances, pollutants, and contaminants into the environment. The U.S. Army's investigation of contaminated sites at FWA began in 1989 under the Installation Restoration Program (IRP) and the installation was added to the CERCLA National Priorities List in 1990.

The USEPA (Region 10) and the Alaska Department of Environmental Conservation (ADEC) began working closely with the U.S. Army to better understand the nature and extent of contamination at FWA and its threat to human health and the environment. The three parties negotiated the FWA NPL Site Federal Facility Agreement, (FFA), which was signed in March 1992. The FFA ensures that environmental impacts associated with past practices at FWA are investigated and remedial actions are completed to protect human health and the environment. This agreement sets deadlines, objectives, responsibilities, and procedural framework for implementing the IRP at FWA. The FFA establishes and describes the CERCLA process as applied to FWA.

An additional goal of the FFA was to integrate the U.S. Army's CERCLA response obligations and Resource Conservation and Recovery Act (RCRA) corrective action obligations at FWA. The FFA states that remedial actions implemented under the agreement will be protective of human health and the environment such that remediation of releases shall obviate the need for further corrective actions under RCRA.

Each of the parties to the FWA FFA is represented by a Remedial Project Manager (RPM). They meet regularly in accordance with the FFA to discuss the U.S. Army's progress regarding remedial actions selected in Record of Decision (ROD) documents and to address related issues as they arise during the course of remedial actions. The RPMs meet when needed and routinely make themselves available to each other for purposes of FWA remediation (e.g., for technical reviews, modifying monitoring programs, etc.) and to meet the intent and commitments of the FFA.

Site locations evaluated in this five-year review are illustrated on Figure 2-1. Table 2-1 lists the dates of important events for FWA and OU-1 through OU-6.

Table 2-1 Chronology of Site Events

Event	Date
Site-Wide	
FWA listed on the NPL	August 1990
FFA signed	1992
2-PTY Agreement signed[1]	1992
First FWA Five-Year Review Report finalized	September 2001
FWA Construction Complete concurrence received from the USEPA[2]	2002
Second FWA Five-Year Review Report finalized	September 2006
Third FWA Five-Year Review Report finalized	September 2011
OU-1 801 Drum Burial Site	
Drum storage and disposal activities	1950s and 1960s
Preliminary source evaluation (PSE) conducted	1991
Buried drums discovered during construction; geophysical survey conducted with two anomalies found.	1992
Second PSE conducted; 92 drums excavated and removed from site, 18 contained product.	1992 and 1993
Excavation of 34 drums (8 containing product); additional monitoring wells installed and sampled.	1995
Initial response conducted that included geophysical surveys, removal of drums, removal of contaminated soil, and installation of monitoring wells.	September 1996
Final remedial investigation (RI) report issued (Site N-4, 801 Drum Burial Site, Building 1599, Chemical Agent Dump Site, and Building 2077).	September 13,1996
Final Feasibility Study (FS) report issued	February 1997
Proposed Plan for remedial action issued	February 1997
Stockpiled soils removed from site	1997
ROD signed	June 1997
Additional excavations performed, no additional drums found	October 1997
Final Operation, Maintenance and Monitoring (OM&M) report issued	December 2000
Interim Remedial Action Report (RACR) issued	May 2001

[1] The 2-PTY agreement deferred source areas limited to potential petroleum contamination to investigation and clean up under Alaska State regulation. The 2-PTY sites are CERCLA-exempt and have been excluded from this review.

[2] Although construction completion was recorded in 2002, remedial actions are still in progress at FWA. The USEPA considers construction completion for sites meeting the following criteria: 1) Any necessary physical construction is complete, whether or not final cleanup levels or other requirements have been achieved; or 2) USEPA has determined that the response action should be limited in measure that do not involve construction; or 3) The site qualifies for deletion from the NPL. (https://www.epa.gov/superfund/superfund-remedial-action-project-completion-and-construction-completions) FWA does not currently meet this criteria.

Table 2-1 Chronology of Site Events

Event	Date
Cleanup Operations and Site Exit Strategy (CLOSES) Evaluation issued	April 2004
OU-2 Former Building 1168 Leach Well	
Lube oil and vehicle storage facility operations	1949 to 1962
Site converted into a petroleum test laboratory	1962
Groundwater survey conducted; USEPA recommends further investigation	1990
PSE conducted	1992 and 1993
Source area pilot-scale air sparge/soil vapor extraction (AS/SVE) remediation system installed.	November 1994
Final RI report issued	January 25, 1996
Proposed Plan for remedial action issued	April 1996
Final FS report issued	April 29, 1996
ROD signed	January 1997
Building 1168 demolished	1997
Active AS/SVE treatment completed	1998
RACR completed for Former Building 1168 AS/SVE system.	May 1999
Final OM&M plan issued	December 2000
AS/SVE system decommissioned	2003
In-situ chemical oxidation (ISCO) treatability study injection at the Former Building 1168 Three Party (Leach Well) Site.	October 2010
OU-2 DRMO Yard	
Vehicle storage and vehicle maintenance shop activities	1945 to 1961
Site converted to salvage yard and drum storage	1961
Diesel spill near Building 5001	Early 1980s
Removal of eight underground storage tanks (USTs)	1988 to 1996
Installation and semiannual sampling of monitoring wells	1990 to 1993
Soil and groundwater contamination discovered north of building 5001	July 1992
PSE conducted to assess extent of soil contamination	September 1992
RI conducted	1993
Proposed Plan for remedial action issued	April 1996
Final FS report issued	April 29, 1996
ROD signed	January 1997
RACR completed for OU-2	August 1999
Final OM&M plan issued	December 2000

Table 2-1 Chronology of Site Events

Event	Date
CLOSES evaluation completed	March 2004
DRMO-1 Three-Party treatment system decommissioned	October 2008
In-situ chemical reduction (ISCR) treatability study injection at the DRMO-1 and DRMO-4 Three-Party Sites.	August 2009
Supplemental ISCR injection at the DRMO-1 Three-Party Site	August 2010
OU-3 Remedial Area 1B – Birch Hill Tank Farm	
Tank farm constructed with fourteen 10,000 barrel bolted steel ASTs	1943
Two 25,00 barrel ASTs added to the tank farm	1956
Two 2,250 barrel ASTs added to the Truck Fill Stand	1956
Soil gas survey conducted	1988
Picket wells installed	1992
RI fieldwork conducted	September/October 1994
RI and Risk Assessment reports submitted to USEPA	October 1994
FS submitted to USEPA	April 1995
Proposed Plan for remedial action issued	April 1995
ROD signed	January 1996
AS/SVE systems installed at Former Building 1173 and Lazelle Road	1996
Remedial Design/Remedial Action Statement of Work issued	April 1996
Lazelle Road system relocated to the Truck Fill Stand and the Former Building 1173 system expanded to cover Lazelle Road source area	1997
Product recovery treatability studies initiated at the BHTF	1998
Thaw Channel treatment system installed	1999
Explanation of Significant Differences (ESD) signed	September 2002
Interim RACR completed	September 2002
OU-3 Valve Pits and ROLF	
ROLF constructed	1939
Three 1,100 barrel ASTS added	1943
Soil-gas survey conducted	1988
Monitoring wells installed	1989
RI fieldwork conducted	September/October 1994
RI and Risk Assessment reports submitted to USEPA	October 1994
FS submitted to USEPA	April 1995
Proposed Plan for remedial action issued	April 1995

Table 2-1 Chronology of Site Events

Event	Date
ROD signed	January 1996
AS/SVE treatment systems installed at Valve Pits A, B, and C; Central Header; and Former Building 1144	July and August 1996
Remedial Design/Remedial Action Statement of Work issued	April 1996
AS/SVE systems expanded	1997
AS/SVE treatment system installed at the Eight Car Header sub-source area; Central Header and Former Building 1144 treatment systems further expanded	1998
ESD signed	September 2002
Interim RACR completed	September 2002
AS/SVE treatment system at Eight-Car Header expanded to include upgradient area; Central Header and Former Building 1144 treatment systems also expanded.	2004
AS/SVE systems at Valve Pits B and C decommissioned	2005
Valve Pit A *in-situ* injection treatability study performed	October 2010
OU-3 Remedial Area 3 – FEP Mileposts 2.7 and 3.0	
Soil-gas survey conducted along FEP	1989
Monitoring wells installed	1991
RI fieldwork conducted	September/October 1994
RI and Risk Assessment reports submitted to USEPA	October 1994
FS submitted to USEPA	April 1995
Proposed Plan for remedial action issued	April 1995
ROD signed	January 1996
AS treatability study conducted at Milepost 2.7 source area	1996
Remedial Design/Remedial Action (RD/RA) Statement of Work issued	April 1996
Oxygen releasing compound (ORC) treatability study completed at Milepost 3.0 source area.	1997
Approximately 1,500 cubic yards (CY) of soil removed from the Milepost 2.7 source area for *ex-situ* remediation treatability study.	1998
Approximately 6,000 CY of soil removed from the Milepost 3.0 source area for *ex-situ* remediation treatability study.	2000
ESD signed	September 2002
Interim RACR completed	September 2002
Ex-situ soil treatment systems decommissioned	2003
CLOSES evaluation conducted	2004
In-situ treatability studies began at Mileposts 2.7 and 3.0	October 2009

Table 2-1 Chronology of Site Events

Event	Date
OU-4 Landfill and Coal Storage Yard	
Landfill activities begin	Early 1950s
Soil and groundwater study conducted	1990
Groundwater monitoring performed	1991 and 1992
RI conducted	1993 and 1994
RI report issued	November 1994
Proposed Plan for remedial action issued	October 1995
Final FS report issued	November 1995
Area of petroleum hydrocarbon and lead contaminated soil covered with approximately 8 feet (ft) of construction debris and ash.	Prior to 1996
ROD signed	August 1996
Landfill Project Site Plan completed	July 1997
Cap constructed over inactive portion of landfill	1997
AS/SVE treatment system installed at coal storage yard	1997
RACR finalized	March 1999
AS/SVE system shut down to evaluate rebound	2004
OM&M plan issued	January 2001
Building 1191 (Landfill Caterpillar Shed) preliminary investigation conducted.	October 2012
OU-5 West Quartermaster's Fueling System	
Industrial maintenance activities involving solvents, petroleum, oil, and lubricants (POLs), pesticides, and other hazardous activities.	1930s to 1960s
Approximately 30,000 gallons of diesel fuel leaked	1971
16,000 gallons of gasoline spilled	1971
Fuel leak of unknown origin into the Chena River	1980
North Airfield groundwater investigation	1994
Initiation of WQFS1 Horizontal Well AS/SVE with treatability study	Spring 1997
Initial Chena River Aquatic Assessment Program (CRAAP) investigations conducted	1997 and 1998
RI report issued	November 1996
FS report issued	1998
Proposed Plan for remedial action issued	June 1998
OU-5 bench-scale column study initiated	January 1998
Initiation of soil heating AS/SVE treatability study at WQFS1	Spring 1998

Table 2-1 Chronology of Site Events

Event	Date
Initiation of WQFS1 source area AS/SVE treatability study at WQFS1	August and September 1998
WQFS2 Sparge Curtain Treatability Study initiated	August 1998
ROD signed	May 1999
WQFS3 AS/SVE Treatability Study initiated	August 2000
Draft 2000 RACR completed	September 2001
Additional CRAAP investigation performed	2002
WQFS2 SVE system and catalytic oxidizer shut down	January 2004
CRAAP investigations terminated by RPMs	2005
WQFS 1, 3, and 4 AS/SVE systems shut down and rebound study initiated	November 2005
OU-5 East Quartermaster’s Fueling System	
Vehicle storage and maintenance, dry cleaning, fuels testing, refueling, pesticide storage and mixing, and waste storage take place on site.	1970s
Natural Attenuation Treatability Study initiated	September 1997
AS/SVE Treatability Study initiated at Building 1060 East	June 1994
ROD signed	May 1999
AS/SVE Treatability Study at Building 1060 East completed	September 2000
AS/SVE system installed at Building 1060 West site	August to December 2000
Final Intrinsic Remediation Evaluation report submitted	November 2000
Draft 2000 RACR issued	April 2001
Building 1060 West AS/SVE system shut down and Contaminant Rebound Study initiated	October 2005
Building 1060 West AS/SVE system decommissioned	August 2009
OU-5 Remedial Area 1A – Birch Hill Tank Farm ASTs	
Tank farm constructed with fourteen 10,000 barrel bolted steel ASTs	1943
Two 25,00 barrel ASTs added to the tank farm	1956
Tank farm permanently closed; tanks, facility piping, and fuel handing equipment purged of fuel and cleaned and piping disconnected, flanged off, and filled with nitrogen.	January 1994
RI and Risk Assessment report submitted	October 1994
FS issued	April 1995
Proposed Plan submitted	April 1995
ROD signed	January 1996
Remedial Design/Remedial Action Scope of Work issued	February 1996
AS/SVE remediation systems installed at Building 1173 and Lazelle Road	1996

Table 2-1 Chronology of Site Events

Event	Date
Remedial Design/Remedial Action Statement of Work issued	April 1996
Lazelle Road system relocated to the Truck Fill Stand and the Former Building 1173 system expanded to cover Lazelle Road source area	1997
Product recovery treatability studies initiated at the Birch Hill Tank Farm	1998
Thaw Channel treatment system installed	1999
Product Recovery treatment system installed	2000
ESD signed	September 2002
Interim RACR completed	September 2002
OU-5 OB/OD Area	
OB/OD of munitions conducted	Mid 1960s to mid-1980s
USEPA and ADEC conduct site visit for RCRA Facility Assessment	1990
US Army Environmental Hygiene Agency conducted evaluation of the OB/OD Area	1990
Federal Facility Compliance Agreement (FFCA) signed by the U.S. Army and the USEPA identified the OB/OD as a regulated unit	1991
Field investigation and soil sampling conducted at the OB/OD Area	September 1994
Additional site visit and soil sampling conducted	1995
RI/FS Final report issued	1996
ROD signed	1996
Site visit conducted	1999
Interim Closure Plan issued	August 1999
RCRA Permit effective	November 2013
Safety Clearance visual and geophysical survey including the OB/OD area conducted	June 2015
OU-6 Former Communications Site	
Site areas cleared for the construction of troop billets, motor pools, dining halls, and other essential facilities.	Late 1940s to late 1950s
Site used for equipment and vehicle disposal, salvage, and maintenance activities, as well as staging area for railroad construction activities and a concrete batch plant.	Late 1940s to 1960s
Communications and radar systems structure constructed.	Prior to 1956
Site selected for military family housing	2002 and 2003
Geotechnical and environmental investigations conducted; contaminated soil removal actions performed.	2003 to 2005
Site cleared for construction of the Taku Gardens Family Housing Development; excavations for building foundations, utilities, and other	2005

Table 2-1 Chronology of Site Events

Event	Date
infrastructure started.	
PCB-contaminated soil and buried debris uncovered.	July 2005
Time-critical removal action of PCB-contaminated soil performed.	September 2005
PSE (first phase) investigation conducted	Winter of 2005 to 2006
PSE (second phase) investigation conducted.	Summer and fall of 2006
PCB-contaminated soil removed.	2007 and 2008
Eight-ft high chain-link fence with three-stranded barbed wire installed around the site perimeter.	Spring of 2007
RI field work conducted	2007 through 2010
Preliminary Source Evaluation II report issued	May 2007
Action Memorandum issued; it established interim land use controls (LUCs) for the site and documented the time-critical removal action.	November 19, 2007
RI report issued	December 2010
Second time-critical soil removal action performed.	2010 and 2011
FS issued	May 2011
Proposed Plan issued	January 2, 2013
ROD signed	January 29, 2014
Remedial Design (RD)/Remedial Action (RA) report finalized	June 2015

3.0 BACKGROUND

This section provides general information applicable to FWA. OU-specific information is provided in Section 5.0.

3.1 Physical Characteristics

As described in the FFA, FWA is located within the Fairbanks North Star Borough in interior Alaska and occupies approximately 911,604 acres on the east side of Fairbanks (Figure 1-1 and Figure 3-1). The Fairbanks North Star Borough is lightly populated with several scattered developments. The City of Fairbanks (population 35,000) is on the western boundary of FWA. The installation consists of three primary areas:

- The main post two miles east of Fairbanks between the Chena and Tanana Rivers consisting of a cantonment area, a small arms range complex, and a close-in-range complex.
- The Tanana Flats training area across the Tanana River from the main post.
- The Yukon Training Area 16 miles east-southeast of Fairbanks, adjacent to Eielson Air Force Base.

3.1.1 Geology

FWA is underlain by soil and sediment that consist of silt, sand and gravel that ranges in thickness from 10 ft to more than 400 ft before encountering bedrock. A 5 ft thick surficial soil layer of fine-grained soil overlies deeper alluvial deposits that consist of varying amounts of sand and gravel that are commonly layered. Where present, permafrost forms discontinuous confining layers that influence groundwater movement and distribution. The depth to permafrost, when present, ranges from 2 to 40 ft below ground surface (bgs). The greater depths are found on cleared and developed land surfaces, where thermal degradation of underlying permafrost occurs.

3.1.2 Hydrology

The Chena River flows through FWA, the City of Fairbanks, and eventually into the Tanana River. The Tanana River borders the southern portion of FWA. The main aquifer in this area is the Tanana Basin alluvial aquifer, which is a buried river valley. The aquifer ranges from a few ft thick at the base of Birch hill to at least 300 ft thick under the installation’s main cantonment area. The aquifer may reach a thickness of 700 ft in the Tanana River Valley. Groundwater in the Tanana-Chena floodplain generally is considered to be unconfined in permafrost-free areas. A confined aquifer may develop seasonally where the depth to the water table is less than the depth of the seasonal frost penetration.

Groundwater movement between the Tanana and Chena Rivers generally follows a northwest regional direction, similar to flow direction of the rivers. Seasonal changes in groundwater flow directions of up to 180 degrees are not uncommon in the area due to the effects of changing river stages in the Tanana River and, to a lesser extent, the Chena River. Groundwater levels near the Chena River fluctuate greatly because of river stage and interactions with the Tanana River. Typically, groundwater levels rise during spring ice breakup and late summer runoff, and drop during fall and winter when rainfall decreases and precipitation becomes snow.

3.2 Land and Resource Use

The current and future mission of FWA is to remain as an operational base; there is no expectation of closure in the near future. Primary missions at FWA have included training of infantry soldiers in the arctic environment, testing of equipment in arctic conditions, preparation of troops for defense of the Pacific Rim, and rapid deployment of troops worldwide. On-site activities include the operation, maintenance, and repair of fixed-wing aircraft, helicopters, tactical and non-tactical vehicles, weapon systems, and general support activities.

Industrial activities at FWA include power generation, steam heat production, drinking water production, treatment, and distribution, standby power and water production, maintenance operations, landfill operations, and grounds maintenance. Also present is the Haines/Eielson Pipeline Extension.

Groundwater is the only source of potable water used at FWA and the Fairbanks area. Approximately 95 percent of FWA's potable water is supplied through a single distribution system fed by two large-capacity wells located in Building 3559, near the Post Power Plant. These wells are completed at a depth of approximately 80 ft bgs and provide between 1.5 million and 2.5 million gallons of water per day to the Post Water Treatment Plant for processing and distribution. The other five percent of potable water comes from three individual wells, one class C well at the DRMO Yard and two wells at a Golf Course. In addition to the main drinking water supply wells, there are five emergency standby supply wells located around the cantonment area. They were completed between 80 and 120 ft bgs and are capable of pumping approximately 250,000 gallons per day per well.

Golden Heart Utilities has four water supply wells located 1¼ miles downgradient of the installation's boundaries, on the banks of the Chena River (see Figure 3-1). All municipal water users are currently supplied from these wells. At one time, College Utilities also supplied water from three water wells located along the Chena River, but they have not been used since 2002.

3.3 History of Contamination

Beginning in 1938, fuels, waste solvents, and pesticides were disposed of on the ground. Spills associated with fuel management, storage, transportation, and handling were common. Waste oils, solvents, and contaminated fuels were also incinerated at the installation's power plant and fire training areas, a practice that was discontinued in 1993. Waste oils commonly were used for dust control. USTs for waste oil, fuel, lubricants, and solvents were installed at most maintenance facilities. A majority of these tanks eventually leaked and released contaminants to soil and groundwater. All existing USTs were removed and/or replaced with double walled, cathodically protected tanks with leak detection systems.

Pesticides (insecticides, herbicides, fungicides, avicides and rodenticides) have been used over the years to maintain grounds and structures and to prevent pest-related health problems. Pesticides were reported to have been mixed on inadequate surfaces and/or stored in such a way to allow releases to the soil.

4.0 FIVE-YEAR REVIEW PROCESS

4.1 Administrative Components

The following activities were performed for this five-year review:

- Potentially interested parties and the local community were notified of the start of the five-year review.
- Documents and site data were reviewed.
- Site inspections were performed.
- Interviews were conducted with FWA Directorate of Public Works (DPW) staff and USACE Alaska District staff with insight on decisions made and activities completed at the sites.

This five-year review report was conducted and written by staff of the USACE Buffalo District.

- Michelle Barker, FE, PMP, HTRW Regional Technical Specialist
- William Frederick, Hydrogeologist
- Karen Keil, PhD, Environmental Toxicologist
- Holly Akers, PE, Project Manager
- Jane Staten, Project Engineer
- James Stachowski, PE, Project Engineer

Staff from FWA also provided assistance.

4.2 Community Notification and Involvement

A public notice has been published in the Fairbanks Daily News Miner, a Fairbanks, Alaska newspaper, and in the Alaska Post, the FWA newspaper, stating that the five-year review process had begun.

The five-year review report will be made available to the public once it has been finalized. A copy of the document will be placed in the following repositories:

Noel Wien Public Library
1215 Cowles Street
Fairbanks, Alaska 99701
(907) 459-1020

Fort Wainwright CERCLA Library
Building 3023
Fort Wainwright, Alaska 99703
(907) 361-9687

Fort Wainwright Post Library
3700 Santiago Avenue
Fort Wainwright, Alaska 99703
(907) 353-2642

Upon completion of the five-year review report, a public notice will be placed in the Fairbanks Daily News Miner and the Alaska Post to announce the availability of the final five-year review report in the document repositories.

4.3 Document Review

Relevant, site-related documents were reviewed, including the RODs, previous five-year review reports, remedial action work plans, remedial action completion reports, RCRA permit documents, and recent monitoring/sampling data. A complete list of documents reviewed is provided in Attachment 2. Documents reviewed for the risk assessment and toxicology review are listed in Attachment 8. The documents were obtained from the FWA staff, from the administrative record file, and from public repositories at Noel Wien Library in Fairbanks and the FWA Post Library.

4.4 Data Review

Data reviewed for each OU are documented in Section 5, Attachment 10, Attachment 11, and Attachment 12.

4.5 Site Inspections

Site inspections were conducted by USACE on August 11, 2015. They were attended by USACE staff Karen Keil (Risk Assessor) and Holly Akers (Project Manager) and lead by Brian Adams, FWA Restoration Project Manager.

Observations for each OU are described in Section 5. Site inspection checklists are included in Attachment 4. Photographs are included in Attachment 5.

4.6 Interviews

Three interviews were conducted in support of the five-year review. USACE Buffalo interviewed FWA staff Joseph Malen (Remedial Program Manager) and Brian Adams (Remedial Project Manager) from August 10 to 13, 2015. USACE (Anchorage District) representative Bob Hazlett responded in writing to a five-year interview questionnaire on February 26, 2016.

U.S. Army Environmental Command (USAEC) representative Michael Kipp, Environmental Restoration Manager, was also present during this period, but was not interviewed.

A meeting was held with Fairbanks Environmental Services (FES), a FWA contractor, on August 12, 2015. It was attended by:

- USACE Buffalo District staff
    - Karen Keil
    - Holly Akers
- FWA DPW staff
    - Joseph Malen
    - Brian Adams
- FES
    - Craig Martin
    - supporting staff

A meeting was held at the ADEC offices in Anchorage on August 13, 2015 to discuss the five-year review process. It was attended by:

- ADEC
    - Guy Warren, Remedial Project Manager
- USEPA
    - Sandra Halstead, Remedial Project Manager
- USAEC
    - Michael Kipp, Environmental Restoration Manager
- Fort Wainwright, DPW
    - Joseph Malen
    - Brian Adams
- USACE Buffalo District
    - Karen Keil
    - Holly Akers
- USACE Anchorage
    - Bob Hazlett

ADEC and USEPA requested written interview questionnaires at the meeting. Interview questionnaires were provided to ADEC and USEPA representatives on February 10, 2016. A completed questionnaire was received from the USEPA on July 27, 2016 and a completed questionnaire was received from ADEC on July 21, 2016. They are included in Attachment 6. A Restoration Advisory Board is currently not active at FWA.

5.0 OPERABLE UNIT SITES

5.1 OU-1 801 Drum Burial Site

5.1.1 Background Information

5.1.1.1 Physical Characteristics

The 801 Drum Burial Site is located between the west bank of the Chena River and River Road and south of the Alaska railroad bridge (Figures 2-1 and 5-1). It covers approximately 20 acres, is currently undeveloped, and vegetated with grass, brush and trees. No endangered or threatened species reside in the area.

The depth to groundwater varies from about 5 to 15 ft bgs across the site. Monitoring of groundwater levels has shown groundwater flow to be generally consistent with the regional west-northwesterly flow direction. However, because the site is located close to the Chena River, the groundwater flow direction and gradient can fluctuate seasonally in response to the water level and flow of the river. During periods of high water in the Chena River, the flow direction on site is generally to the west, away from the river. During low water, usually in the winter and early spring, the groundwater flow direction is eastward, toward the river.

5.1.1.2 Land and Resource Use

Land use at OU-1 is recreational and is expected to remain recreational due to its location adjacent to the Chena River. Military housing known as the Birchwood Estates is situated across River Road, immediately west of the OU.

Drinking water for Birchwood Estates (as well as the City of Fairbanks) is supplied water wells operated by Golden Heart Utilities. The wells are approximately 1¼ miles downgradient and in the same unconfined aquifer as the contaminant source area for this site. Because of this, groundwater use at OU-1 is considered residential.

5.1.1.3 History of Contamination

The 801 Drum Burial Site was used as a drum storage and disposal area. The drums contained diesel fuel, gasoline, jet fuel, solvents, asphalt, pesticides, and lubricants. Aerial photographs from the 1950s and 1960s show a pit on the southwest corner of the storage area. Subsequent aerial photographs (1974) indicate that the pit was filled. In 1992, buried drums were found during the construction of a storm sewer that runs west-east through the source area and outfalls in the Chena River. Numerous drums were removed during these construction activities.

5.1.1.4 Initial Response

Geophysical surveys and three separate removal actions were conducted between 1992 and 1997. At least 244 drums and 850 CY of contaminated soil were removed from the site. Drum contents included fuels, solvents, pesticides and lubricants. The removed soil was contaminated with pesticides and diesel range organics (DRO). It was stockpiled for later use in a phytoremediation treatability study that was designed and implemented to evaluate the performance of phytoremediation for reducing pesticide (aldrin and dieldrin) concentrations in soil. Five treatment cells were constructed for the study. Several plant types were evaluated and both drained and saturated conditions were maintained. After four years of monitoring, overall results showed that the aldrin concentrations decreased significantly whereas dieldrin concentrations increased slightly. This soil was ultimately disposed of in a lined cell in the FWA landfill in 2003 and 2004.

5.1.1.5 Basis for Taking Action

Sampling conducted prior to and during the RI detected petroleum hydrocarbons, VOCs, pesticides, and metals in surface soil, subsurface soil, and groundwater; metals in Chena River water samples; and VOCs, pesticides, and metals in Chena River sediments. Preliminary data suggested that contaminant plumes in the groundwater were migrating from the known source areas; however, migration rates were undetermined due to the complexity of groundwater movement in the area. Results of the RI also suggested a high potential for the contaminants to migrate to the Chena River and affect downgradient groundwater users if not controlled.

Site COCs were documented in the ROD (U.S. Army 1997b) and listed in Table 5-1. They were based on the results of a baseline risk assessment that assumed residential use of groundwater and recreational use of soil.

Table 5-1 OU-1 801 Drum Burial Site COCs

Media	COC
Groundwater	Aldrin
	Benzene
	cis 1,2-DCE[1]
	1,1-DCE
	Dieldrin
	DRO[1, 2]
	Vinyl chloride
Surface and Subsurface Soil	Aldrin
	Dieldrin
	DRO[2]

Notes:

1 Footnote a to ROD Table 7-1, *"Monitoring and sampling will follow EPA protocols and will not be limited to the specific contaminants of concern"*

2 Footnote to ROD Table 7-1, *"diesel range organics will be cleaned up to levels consistent with the proposed State of Alaska regulations (18 AAC 75)"*

DCE dichloroethene

5.1.2 Remedial Actions

5.1.2.1 Remedy Selection

Remedial action objectives (RAOs) established in the June 1997 ROD for the 801 Drum Burial Site are listed below.

Groundwater

- Ensure that groundwater quality at the 801 Drum Burial Site meets federal and state standards.
- Minimize potential migration of contaminated groundwater to the Chena River and downgradient drinking water wells.

- Establish and maintain institutional controls (ICs) to ensure that the groundwater will not be used until federal and state maximum contaminant levels (MCLs) are attained, except for activities undertaken to initiate the selected remedies.

Soil

- Prevent further leaching of contaminants from soil to groundwater.
- Reduce risks associated with exposure to contaminated soil and drums.
- Prevent migration of soil contaminants to groundwater which could result in groundwater contamination and exceedances of federal MCLs and Alaska Water Quality Standards (AWQS) (18 Alaska Administrative Code [AAC] 70).

The cleanup goals for COCs in groundwater and soil identified in the ROD are presented in Table 5-2.

Table 5-2 OU-1 801 Drum Burial Site COC Cleanup Goals

Media	COC	Cleanup Goal	Basis [1]
Groundwater	Aldrin	0.0042 µg/L	RBC
	Dieldrin	0.004 µg/L	RBC
	Benzene	5 µg/L	MCL
	1-1-DCE	7 µg/L	MCL
	cis-1,2-DCE	70 µg/L	MCL
	Vinyl chloride	2 µg/L	MCL
	DRO	15 µg/L	ARAR
Surface Soils (direct contact)	Aldrin	3.8 mg/kg	RBC
	Dieldrin	4.0 mg/kg	RBC
Subsurface and subsurface soils (direct contact and migration to groundwater, respectively)	Aldrin	3.8 mg/kg	RBC
	Dieldrin	4.0 mg/kg	RBC
	DRO	200 mg/kg	ARAR

Notes:

1 Groundwater cleanup levels were based on federal or state drinking water MCLs or an excess lifetime cancer risk of $1x10^{-6}$ for a residential exposure scenario. Risk for soil was based on a residential exposure scenario associated with an excess lifetime cancer risk of $1x10^{-4}$.

2 The DRO groundwater cleanup level can be found in Table C of 18 AAC 75, and the current State of Alaska DRO soil cleanup level for migration-to-groundwater in the under 40-inch zone can be found in Table B2 of 18 AAC 75 (revised as of January 1, 2016).

ARAR applicable or relevant and appropriate requirement
RBC risk-based concentration
mg/kg milligrams per kilogram

μg/L micrograms per liter

The selected remedy consisted of:

- Locating and removing potential buried drums at the site.
- Establishing and maintaining ICs to ensure that groundwater would not be used until federal and state MCLs were attained, except for activities undertaken to initiate the selected remedy. The ICs would include restrictions governing site access, construction, and well development or placement as long as hazardous substances remained on site at levels that preclude unrestricted use.
- Natural attenuation of groundwater with long-term monitoring.
- A contingent remedy that included an AS/SVE system to treat VOCs. It would be implemented when either: 1) the concentrations of contaminants in the groundwater plume show an increasing trend over any three consecutive sampling events or 2) the designated monitoring points around the plume indicate that contaminants are migrating away from the source area.

The estimated timeframe to reach the cleanup goals was 10 years (VOCs) and 100 years (pesticides) (U.S. Army 1997b).

5.1.2.2 Remedy Implementation

Groundwater Monitoring

Groundwater monitoring began in September 1997, after the ROD was signed. The monitoring network included 16 wells screened across the water table; they varied in depth from 20 to 40 ft bgs. Over the years, the number of wells monitored and the sampling frequency changed several times. Currently, eight of the 16 monitoring wells are monitored once every five years for ROD COCs (aldrin, dieldrin, benzene, 1,1-DCE, cis-1,2-DCE, vinyl chloride, and DRO) as well as gasoline-range organics (GRO). Five OU-1 monitoring wells were recommended for decommissioning in the 2015 groundwater monitoring report (FES, 2016d). Figure 5-1 in Attachment 1 depicts the remaining 11 monitoring wells.

Institutional Controls

ICs at the 801 Drum Burial site include restrictions on site access, construction, and well installation as long as hazardous substances remain onsite at levels that preclude unrestricted use. ICs ensure that the groundwater will not be used until federal and state MCLs are attained. An informational sign describing these ICs was posted at the site in 2001. It was repaired and updated several years later. Since there is no surface contamination at the site, access for non-intrusive activities is unrestricted. Excavation and groundwater intrusion at the site is restricted and subject to approval by FWA DPW Environmental Department.

ICs at each OU are inspected annually and a complete summary of the survey and corrective actions taken are presented in an annual IC report. The first annual report was prepared for 2012 (FES 2013h) and prior inspection results were included in the OU-specific monitoring reports. IC inspections evaluate potential land use changes, site security (monitoring wells, etc., as applicable), or unauthorized groundwater use. In addition, reviews of a FWA IC geographic information system (GIS) layer and the site-specific information in an ADEC contaminated sites database are conducted.

5.1.2.3 Operation, Maintenance, and Monitoring

No active remediation systems are operating at the site and maintenance activities are limited to monitoring well inspections. During the groundwater sampling events, monitoring wells are inspected to ensure that they are accessible, locked and in good condition. Results of the inspections are presented in the monitoring reports. The 2015 OU-1 Monitoring Report stated that the all wells were in satisfactory condition for continued use as monitoring wells (FES 2016).

Currently, eight of the 16 monitoring wells are included in the monitoring program. Since 2010, the monitoring frequency was reduced to once every five years to coincide with the five-year review process. Groundwater is monitored for ROD COCs (aldrin, dieldrin, benzene, 1,1-DCE, cis-1,2-DCE, vinyl chloride and DRO) and for GRO.

5.1.3 Progress Since the Last Five-Year Review

The Third Five-Year Review Report (U.S. Army 2011) provided the following protectiveness statement for the OU-1 801 Drum Burial Site:

> *"The remedy at OU1 has been implemented and is protective of human health and the environment. The remedy is relying upon Monitored Natural Attenuation (MNA) to achieve final cleanup goals in groundwater over time, and in the interim, exposure pathways that could result in unacceptable risks are being controlled and Institutional Controls are preventing exposure to, or ingestion of, contaminated groundwater."*

The following recommendations were provided in the Third Five-Year Review Report:

- Continue groundwater monitoring of the eight wells every five years, prior to the five-year review, to ensure that no off-site migration of contaminants is occurring.
- Perform post-wide IC inspection and evaluate protectiveness. Update restricted use boundaries in GIS as new information becomes available.
- Develop the parameters for an Annual Report of IC effectiveness and corrective actions taken (spring 2012 milestone date).
- Update the database of LUC/IC summary documents (October 2013 milestone date), which consists of tables that describes in greater detail the ICs, the objectives to be met by the restrictions, and any specific restrictions, controls, and mechanisms.

The status of these recommendations and actions taken to address them are discussed below.

- Groundwater samples were collected from eight monitoring wells in May 2015. The data allows for an evaluation of natural attenuation of groundwater contaminants and assessment of off-site migration.
- A post-wide IC inspection is performed and results have been documented in annual IC reports for 2012, 2013, and 2014 (FES 2013d, 2015a, 2015f).
- Parameters for an annual report of IC effectiveness and corrective actions taken have been developed; they are used in the annual IC reports.
- Tables that describe in detail the ICs, objectives to be met by the restrictions, and any specific restrictions, controls, and mechanisms were updated and documented in annual IC reports for 2012, 2013, and 2014 (FES 2013d, 2015a, 2015f).

5.1.4 Site Inspection

The 801 Drum Burial Site was inspected by USACE on August 11, 2015 to examine the remediated area and assess protectiveness of the remedy. The site was forested, all wells appeared to be in good condition, and the informational sign was in good condition. A completed site inspection checklist is provided in Attachment 4 and site photographs are provided in Attachment 5.

FWA staff indicated that LUCs/ICs are maintained as required by the ROD. Review of ICs for the 801 Drum Burial site documented in the draft 2014 IC report (FES 2015f) concluded:

- ICs at the site are in place and no unauthorized well installation or use of groundwater wells was observed.
- No soil disturbing activities were observed.
- Site vegetation is well maintained.
- An informational sign is intact and exhibits signs of water damage.
- Wells currently at the site are easily accessible and secured.
- Site land use and adjacent land use have not changed.

The five-year review site inspection confirmed these conclusions.

5.1.5 Data Review

The most recent groundwater analytical results from May 2015 (Attachment 10) are similar to the previous round of sampling performed in 2010.

- Dieldrin exceeded the ROD risk-based cleanup goal in four of the wells sampled, AP-6326, AP-6331, AP-7284, and AP-10042 (replacement well for AP-7163). Dieldrin was not detected in wells AP-6630, AP-6327, and AP-7279, although the detection limit (0.0045 µg/L) exceeded the cleanup goal (0.004 µg/L).
- Benzene and DRO exceeded their respective cleanup goals in well AP-6327.
- cis-1,2-DCE exceeded the cleanup goal in well AP-6326.

The remaining COCs were below their cleanup goals.

The ROD estimated timeframe to reach the cleanup goals for VOCs (10 years or by 2007) has passed. The ROD estimated timeframe to reach the cleanup goals for pesticides is 100 years, or by 2097.

Trend analysis was performed on available groundwater analytical data using linear regression and the Mann-Kendall test for dieldrin in wells AP-6326, AP-6327, AP-6331 and AP-7282. Wells AP-6630, AP-7284, and AP-7279 were not evaluated because most of the data were censored (i.e., concentrations are predominantly non-detectable) and the Mann-Kendall test loses significant statistical power if most of the data are censored. Well AP-10042 was not evaluated because there were only two data points. Trend analysis was also performed for benzene in wells AP-6326 and AP-6327. Results of the evaluation (at a confidence level of 95%) are provided in Attachment 10 and summarized below. Wells with COCs exceeding the cleanup goals are identified in bold text.

- Dieldrin
    - No trend is identified in wells AP-6327, **AP-6326, AP-6331** and AP-7282.
- Benzene
    - An overall downward trend is identified for well **AP-6327**, however concentrations remained constant between 2010 and 2015.
    - No trend is identified for well AP-6326, although a downward trend is suggested.
- cis-1,2-DCE
    - An overall downward trend is identified for well **AP-6326**.
- DRO
    - No trend is identified in well **AP-6327**.

The dieldrin plume is currently undefined to the west with exceedances of the cleanup goal detected in monitoring well AP-10042. The dieldrin concentrations were detected at 0.029 and 0.022 µg/L above the cleanup goal of 0.004 µg/L. Spatial moment analysis, conducted in the OU-1 2010 and 2015 monitoring reports, indicates that the dissolved dieldrin mass has been stable and no trend has been identified for the location of the center of mass.

Piezometric surface maps indicate that a groundwater divide, trending north-south, is present at the site. Groundwater in the eastern portion of the site discharges to the Chena River, while groundwater in the western portion of the site flows west/northwest. The location of the divide varies with river stage.

The OU-1 COCs are persistent, which may be due to seasonal variation of the groundwater flow direction that is caused by river level fluctuations. The variation of flow direction contributes to minimal off-site migration and appears to cause long natural attenuation response periods (i.e., the contaminants do not experience downgradient dispersion and attenuation). The absence of increasing trends indicates that past source removal actions positively affected site conditions. Although the RAO to meet groundwater cleanup goals has not been attained for benzene, DRO, and cis-1,2-DCE, the data demonstrate that the RAOs are being met.

The 2015 monitoring report provides geochemical data (dissolved oxygen (DO), oxidation-reduction potential (ORP), dissolved iron, dissolved manganese, and sulfate) (FES,2016e). The results indicate that relatively low DO concentrations and relative low ORP are present, which suggest that the aquifer is anaerobic and moderately reduced. A small area surrounding well AP-6327 exhibits significantly reduced conditions. The monitoring report asserts that these conditions may be favorable for attenuation of dieldrin based on prior phytoremediation study treatability study findings for OU-1. Groundwater geochemistry returns to background conditions within approximately 50 ft downgradient of AP-6327.

The 2015 monitoring report made the following recommendations to optimize the long term monitoring program at OU-1:

- Continue groundwater monitoring on a five-year basis from eight monitoring wells including the addition of pesticide samples from monitoring wells AP-6330 and AP-6631.
- Collect biennial (2017 and 2019) samples from monitoring well AP-10042 to establish a dataset for trend analysis.

- Continue VOC analysis for monitoring well AP-6326 to monitor cis-1,2-DCE as recommended in the 2004 CLOSES evaluation.
- Decommission five monitoring wells previously removed from the sampling program (AP-6629, AP-7162, AP-7280, AP-7281, AP-7283).

The monitoring wells proposed for decommissioning are depicted on Figure 4-1, *OU1 Monitoring Wells Recommended for Decommissioning*, in Attachment 10.

The five-year review concurs with these recommendations except for the decommissioning of monitoring well AP-7162, which has been included in a recommendation for monitoring to evaluate vapor intrusion (see Section 5.1.6).

The Risk Assessment and Toxicology Evaluation included in Attachment 8 assessed the OU-1 Drum Burial Site for vapor intrusion risks. The 801 Military Housing Area is located directly across River Road from the site and groundwater flows toward the housing area at least some times during the year (groundwater flow direction is affected seasonally by the river stage). The vapor intrusion assessment compared the USEPA vapor intrusion screening levels (VISLs) to VOC concentrations in the nearest sampled monitoring well, AP-6326. In 2015, the only detected VOCs at AP-6326 included benzene, toluene, TCE, and trans- and cis-1,2-DCE. No exceedances of the USEPA VISLs were identified. Concentrations of 1,2,4-TMB exceeded the VISLs are two monitoring wells (AP-6327 and AP-1010); however this compound was not detected in wells closer to the housing development.

Based on a 2004 CLOSES evaluation and subsequent decision of the RPMs, groundwater monitoring was not performed for VOCs in 2015 at monitoring well AP-10042 or AP-7162 located on the west side of River Road adjacent to the 801 Military Housing Area. AP-10042 was installed in 2010 on-post to replace off-post well AP-7163 and was not sampled for VOCs. Historical data collected from monitoring wells AP-7162 and AP-7163 (replaced with AP-10042 in 2010) was reviewed to make further assessment on the potential risk of vapor intrusion. The most recent sampling events with VOC analyses were conducted in 2005 (AP-7162) and 2010 (AP-7163):

Table 5-3 OU-1 Historical VOC Results for AP-7162 and AP-7163

Compound	Sampling Location	USEPA VISL	ADEC VISL	AP-7162	AP-7163
	Date			2005	2010
cis-1,2-DCE		--	44	<0.12	0.8 J
trans-1,2-DCE		--	380	<0.15	0.14 J
Benzene		370	14	<0.14	<0.15
TCE		15	5.2	<0.14	0.42 J
Toluene		59,000	19,200	1.1	<1.0

No exceedances of the USEPA or ADEC VISLs were identified. No VISLs are available for trans- and cis-1,2-DCE (see Attachment 8 for more details).

5.1.6 Technical Assessment

5.1.6.1 Question A

Is the Remedy Functioning as Intended by the Decision Document?

Yes, the remedy is functioning as intended by the ROD. This assessment is supported by the following information:

- Removal of buried drums and contaminated soil have prevented further leaching of contaminants from soil to groundwater and reduced the risk of exposure.
- Analytical data indicates that groundwater contamination due to benzene and cis-1,2-DCE is attenuating, albeit at a slow rate, and the plumes are stable. The concentrations of dieldrin remain stable and exhibit no trend. The remaining groundwater VOCs, aldrin, 1,1-DCE, and vinyl chloride, are below their cleanup goals.
- LUC/ICs have been implemented and are functioning as intended. No violations have been reported since the previous five-year review.
- The ROD-estimated time frame to reach the cleanup goal is 10 years (VOCs) and 100 years (pesticides). The remedy, MNA, was implemented in 1997. Benzene, cis-1,2-DCE, and dieldrin exceeded their cleanup goals in the most recent monitoring event (May 2015). The estimated time frame to reach the cleanup goals has passed for benzene and 1,2-DCE. However, since the plume remains stable and there are no complete exposure pathways, there is no increased risk to human health and the environment.

The five-year review did not identify opportunities for optimizing the monitoring program other than those currently included in the long term monitoring program reports.

No early indicators of potential problems were identified.

5.1.6.2 Question B

Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Still Valid?

Yes, the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy are still valid. The current exposures and major exposure assumptions for future potential land use at the site have not changed. The toxicity criteria used to develop risk-based cleanup goals are reviewed in Attachment 8. That attachment also evaluates the potential for vapor intrusion at the site, since it was not previously evaluated. The 801 Military Housing Area is located west across River Road. The Housing Area was constructed in 1986-1987 according to City of Fairbanks records and was in place at the time the remedy was selected for the 801 Drum Burial Site; however a vapor intrusion assessment was not completed. USEPA and ADEC guidance on vapor intrusion was either developed or significantly updated within the last five years. The following information was used to make an assessment of the vapor intrusion pathway:

- Based on the RI, soil at the site varies from silty sand and gravel to clean sand and gravel.
- Groundwater is shallow (5 to 15 ft bgs) and groundwater flow direction and gradient at the site fluctuates seasonally and with the flow stage of the Chena River.
- The hydraulic gradient at the site is relatively flat (3 ft per mile) and highly variable.

- One preferential groundwater flow pathway was identified at the site: an underground storm sewer that traverses the 801 Drum Burial Site east-west from the Chena River across River Road south of monitoring well AP-6328 to the 801 Housing Area (see Figure 5-1 in Attachment 1).
- The only compound exceeding the USEPA VISLs was 1,2,4-TMB in monitoring wells AP-6327 and AP-1010. Wells located across River Road closer to the 801 Housing Area including those wells located adjacent to the storm sewer did not contain exceedances of the USEPA VISLs.

Based on this information, the vapor intrusion exposure pathway is incomplete.

There are no newly promulgated or modified requirements of federal or state environmental laws for the COCs that have MCL-based cleanup goals (benzene, 1,1-DCE, cis-1,2-DCE, and vinyl chloride) that would change the protectiveness of the groundwater and soil remedies implemented at the site.

For COCs that have risk-based cleanup goals (aldrin, dieldrin, and DRO), the exposure assumptions, toxicity criteria, and RAOs used at the time of the remedy are still valid.

5.1.6.3 Question C

Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No information has come to light that could call into question the protectiveness of the remedy for the intended use of the property as described in the ROD; however, the USEPA has identified 1,4-dioxane as an emerging contaminant.

An assessment has not been performed at the OU-1 801 Drum Burial Site to evaluate whether a release of the stabilizer 1,4-dioxane occurred. A recommendation to perform sampling is included below; however, this issue is not anticipated to affect protectiveness based on the following information:

- LUCs/ICs have been implemented preventing receptors from direct contact with subsurface contaminants at the Drum Burial Site.
- A hypothetical USEPA VISL was calculated for 1,4-dioxane (530,000 µg/L). This value is over four orders of magnitude greater than a VISL calculated for TCE under the same conditions (15 µg/L). ADEC does not have a VISL for 1,4-dioxane (VISL for TCE in groundwater is 5.2 µg/L). Based on this information, 1,4-dioxane should not pose a risk via vapor intrusion where no risk is identified for TCE.
- Groundwater contaminant concentrations at the Drum Burial Site are relatively low and perimeter monitoring wells do not indicate that contaminants are migrating from the source area to the Chena River or 801 Military Housing Area.
- The closest drinking water supplies include:
    - The Golden Heart Utilities has four water supply wells (AK2310730 - community) located 2.4 miles from the Drum Burial Site on the banks of the Chena River. These wells are unlikely to be influenced by the Drum Burial Site due to the presence of a hydrogeologic divide (Chena River). The system operator was contacted on 27 October 2016 to request monitoring data for 1,4-dioxane as required for this system under the Unregulated Contaminant

Monitoring Rule 3 (UCMR3). The operator indicated that the system was sampled for 1,4-dioxane twice in 2013 (February and August), however, the sampling point was at the entry point to the distribution system (post-treatment). The results indicate that no 1,4-dioxane was detected in the water samples at concentrations above the laboratory's minimum reporting limit of <0.07 µg/L. No raw water quality data was available for 1,4-dioxane.

- Pioneer drinking water wells (AK2310714 - community) for the Hamilton Subdivision are located approximately 1.0 mile from the Drum Burial Site (see Figure 3-1). These wells are unlikely to be influenced by the Drum Burial Site based on the distance of separation and low levels of impacts at the Drum Burial Site.
- The system operator was contacted on 27 October 2016 to request monitoring data for 1,4-dioxane, if available. As of the date of this report, no response has been received.
- FWA has eight on-post wells (AK2310918 - community) and one well servicing the golf course (AK2311095 - non-community). In addition to those wells identified by the State, an emergency water supply well is located within the OU-2 DRMO Yard (see Section 5.3). The well locations are depicted on Figure 3-1. Only one well located on FWA is currently designated as a drinking water source (Building 3559 Water Well). This well is separated from the OU-1 Drum Burial Site by a hydrogeologic divide (Chena River).

- The OU-1 Drum Burial Site is located adjacent to the Chena River. The historical remedial actions at site greatly reduced the magnitude of contaminants left in place and, due to the hydrogeology of the site, have limited mobility. Adverse impacts to the Chena River from 1,4-dioxane at the OU-1 Drum Burial Site are unlikely.
- No other sensitive receptors were identified.

5.1.6.4 Technical Assessment Summary

The 801 Drum Burial Site remedy is functioning as intended by the ROD. Removal actions completed from 1992 to 1997 addressed source drums and impacted soil. ICs have since been established and are maintained to prevent groundwater use. Groundwater monitoring demonstrates that the groundwater plume is stable and attenuating. Groundwater quality has not achieved the VOC cleanup goals in the timeframe estimated in the ROD (2007); however, no risk is currently posed by the groundwater contamination. Contaminant concentrations are decreasing or exhibit no trend. In the last five years, there have been no physical changes to the site that would affect the protectiveness of the remedy. An abbreviated screening of vapor intrusion risk was performed with the calculation of VISLs and comparison to the most recently available groundwater quality data. No exceedances of the VISLs were identified. No changes to the ARARs or risk assessment and toxicology evaluation were identified that would affect the protectiveness of the remedy.

5.1.7 Issues

The following issues were identified that may affect the future protectiveness of the 801 Drum Burial site remedy:

- Under agreement among the RPMs, data was not collected from monitoring wells located between currently monitored points and the 801 Military Housing Area for inclusion in the five-year review. Data from these wells was not available for use in the vapor intrusion assessment at OU-1.
- An assessment for 1,4-dioxane has not been performed at OU-1.

The following concerns were identified that do not affect protectiveness of the remedy:

- The detection limit for dieldrin in groundwater in 2015 exceeded the cleanup goal.
- Insufficient groundwater quality data is available for determining attainment of cleanup levels at monitoring wells AP-10042 and AP-7163.

The following site-wide concern was identified that does not affect the protectiveness of the FWA remedies:

- The site-wide standard operating procedure (SOP) does not include documentation and information regarding all LUCs required throughout FWA.

5.1.8 Recommendations for Follow-up Actions

The following recommendations for follow-up actions were identified at the OU-1 Drum Burial site that may affect the future protectiveness of the remedy:

- Collect groundwater samples from monitoring wells AP-6326, AP-6327, AP-7162, and AP-10042 for analysis for VOCs and complete a vapor intrusion assessment.
- Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the 801 Drum Burial Site. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.

Recommendations for a follow-up actions that do not affect protectiveness of the remedy are provided below:

- Provide greater scrutiny of groundwater analytical detection limits during future monitoring events.
- Increase monitoring frequency in wells AP-10042 and AP-7163 from once every five years to biennial (2017 and 2019) until the next five-year review.

The following site-wide recommendation was identified that does not affect the protectiveness of the FWA remedies:

- The U.S. Army should develop a revised site-wide IC program to include LUC/IC requirements. This will be initiated in November 2016 with a planned completion date of September 2018.

5.1.9 Protectiveness Statement

The remedy at OU-1 801 currently protects human health and the environment because:

- Contaminant source removal (drums and contaminated soil) was completed.
- Migration of COCs in groundwater to the Chena River and downgradient drinking water wells is not occurring based on sampling results that indicate the plume is stable.

- Based on groundwater data and a comparison of groundwater quality to the calculated USEPA VISLs, the vapor intrusion exposure pathway is incomplete at the 801 Drum Burial Site.
- ICs are in-place to ensure that groundwater will not be used until cleanup goals are attained and to assure that exposure to any contaminated soil at the site will not occur.

However, in order for the remedy to be protective in the long-term, the following actions need to be taken to ensure protectiveness:

- Collect groundwater samples from monitoring wells AP-6326, AP-6327, AP-7162, and AP-10042 for analysis for VOCs and complete a vapor intrusion assessment.
- Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the 801 Drum Burial Site. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.

5.2 OU-2 Building 1168 Leach Well

5.2.1 Background Information

5.2.1.1 Physical Characteristics

The Former Building 1168 Leach Well source area is located on the northwestern side of FWA, north of Trainor Gate Road and adjacent to the Trainor gate entrance (Figures 2-1 and 5-2). The nearest surface water body, the Chena River, is approximately 1,800 ft to the southeast. No surface water drainage pathways are evident. No endangered or threatened species reside in the area.

Subsurface soil at the site consists of lenses of interlayered silt, silty sand and poorly graded sand and gravel. Groundwater occurs at 12 to 17 ft bgs. The predominant groundwater flow is to the west-northwest following the trend of the Tanana River Valley. However seasonal changes in flow direction may occur due to the influences of water level changes in the Chena River.

5.2.1.2 Land and Resource Use

Building 1168 was demolished during the summer of 1997 and the site is now a flat, graded gravel lot. The area around the former Building 1168 site was used to stage construction materials for a Sitku Basin military housing project. This project was started in 2006 and completed in 2008, and the former building area remains a flat gravel lot. Groundwater use is considered residential because water supply wells for the City of Fairbanks are located in the same unconfined aquifer as groundwater contamination at the source area.

Surrounding land use includes a Fairbanks public school located approximately 1,000 ft northwest of this site, the Birchwood Estates housing area (formerly the 801 military housing area) approximately 300 ft southwest (upgradient) of the site, and the newly completed Sitku Basin military housing area located along the north side of the site.

5.2.1.3 History of Contamination

Contamination originated from a leach well that received liquids collected in floor drains within Building 1168. From the 1950s to 1997, Building 1168 was used as a lubrication oil and vehicle storage/shop facility, and as a POL laboratory. Floor drains in the building formerly discharged into an oil/water separator designed to allow POL to flow into a storage tank and wastewater to flow through a 4-inch diameter buried waste line to a leach well approximately 100 ft southwest of the former building. The oil/water separator system was decommissioned in 1993. Because of system malfunctions during the 40 years of service, some products entering the oil/water separator were inadvertently conveyed directly to the leach well, subsurface soil, and groundwater. Products suspected to have entered the leach well include oil from engines and transmissions, gasoline, diesel, jet fuel, and solvents.

5.2.1.4 Initial Response

In 1994, a pilot scale AS/SVE system was installed around the leach well to determine whether an *in-situ* treatment system was technically feasible in source area soil and groundwater. The system was modified and expanded in 1996 and 1997 to optimize its effectiveness. The treatment system was designed to operate during May through October. It was operated for four years.

5.2.1.5 Basis for Taking Action

Contaminated soil associated with the former leach well appeared to be the source of groundwater contamination. Initial site investigations discovered a zone of hydrocarbon contamination approximately 4 to 5 ft thick in subsurface soils near the groundwater interface that extended approximately 50 ft radially from the leach well. Contamination from these subsurface soils created commingling benzene and trichloroethene (TCE) plumes in the groundwater 20 to 50 ft bgs.

Based on the results of a risk assessment that assumed industrial use for soil and residential use for groundwater, the following COCs associated with Former Building 1168 Leach Well were established:

Table 5-4 OU-2 Building 1168 Leach Well COCs

Medium	COC
Subsurface Soil	DRO
	GRO
	Benzene
	Toluene
	Ethylbenzene
	Xylenes
Groundwater	Benzene
	PCE
	TCE
	1,1-DCE
	cis-1,2-DCE
	Vinyl chloride

Notes:
PCE tetrachloroethene

5.2.2 Remedial Actions

5.2.2.1 Remedy Selection

Based on the findings of a Human Health and Ecological Risk Assessment, RAOs were established in the January 1997 ROD for OU-2.

Groundwater

- Restore groundwater to its beneficial use of drinking water quality within a reasonable time frame through source control.
- Reduce or prevent further migration of contaminated groundwater from the source areas.
- Prevent use of groundwater containing contaminants at levels above Safe Drinking Water Act (SDWA) and State of Alaska Drinking Water Standard MCLs and AWQS.
- Use natural attenuation to attain AWQS (18 AAC 70) after reaching state and federal MCLs.

Soil

- Prevent migration of soil contaminants to groundwater, which could result in groundwater contamination and exceedances of state and federal MCLs and AWQS (18 AAC 70).

In order to achieve these RAOs, the following remedy was selected.

AS/SVE

- *In-situ* treatment of groundwater via AS to remove VOCs and attain state and federal MCLs.
- *In-situ* treatment of soil via SVE to prevent contaminated soil from acting as an ongoing source of contamination to groundwater.
- Treatment system evaluation and modification as necessary to optimize effectiveness.
- Periodic monitoring and evaluation of air emissions from the AS/SVE treatment system to meet air emission requirements.
- Periodic groundwater monitoring and off-gas measurements to determine attainment of RAOs.

Natural Attenuation and Groundwater Monitoring

- Achieve AWQS through natural attenuation after active treatment attains state and federal MCLs.

Institutional Controls

- Maintain ICs, including restricted access and well development restrictions, as long as hazardous substances remain on site at levels that preclude unrestricted use.

The cleanup goals for COCs in groundwater identified in the 1997 ROD are presented in Table 5-5.

Table 5-5 OU-2 Building 1168 Leach Well COC Cleanup Goals

Medium	COC	Cleanup Goal	Basis [1,2]
Subsurface Soil	DRO	100 mg/kg	ADEC 18 AAC 78
	GRO	50 mg/kg	ADEC 18 AAC 78
	Benzene	0.1 mg/kg	ADEC 18 AAC 78
	BTEX[3]	10 mg/kg	ADEC 18 AAC 78
Groundwater	Benzene	5 µg/L	MCL
	PCE	5 µg/L	MCL
	TCE	5 µg/L	MCL
	1-1-DCE	7 µg/L	MCL
	cis-1,2-DCE	70 µg/L	MCL
	Vinyl chloride	2 µg/L	MCL

Notes:

1 Groundwater cleanup levels are based on federal and state drinking water MCLs.
2 Soil cleanup goals are based on the ADEC soil cleanup matrix to be used as a guidance for treatment of in situ soils.
3 BTEX = sum of benzene, toluene, ethylbenzene, and total xylene concentrations

The ROD estimated timeframe to reach the cleanup goals was 15 years, or by 2012 (U.S. Army 1997a).

5.2.2.2 Remedy Implementation

AS/SVE System

In 1994, a pilot scale AS/SVE system was installed around the leach well to determine whether an *in-situ* treatment system was technically feasible. The system was modified and expanded in 1996 and 1997 to optimize its effectiveness based on an evaluation of monitoring data. The treatment system was operated seasonally (May through October) for four years. It was shut down in December 1998 after the RAOs were achieved. The system was decommissioned in 2003 in accordance with recommendations provided in a 2003 CLOSES report (CH2M HILL 2003b).

During the period of operation, the system removed 2,680 pounds of hydrocarbons through volatilization and an estimated 1,900 pounds of hydrocarbons through aerobic biodegradation. Annual soil sampling during operation of the AS/SVE system indicated that the system was *"beneficial at reducing soil contaminant concentrations in the source area"* (CH2M HILL 2003b).

Groundwater Monitoring and In-situ Chemical Oxidation Treatability Study

When the groundwater cleanup goals identified in the ROD were attained in 1998, the AS/SVE system was shut down and the monitoring frequency was decreased from quarterly to annually. Within a few years following system shut down, minor rebound in contaminant concentrations was observed and the RPMs agreed to increase the frequency of groundwater monitoring to semi-annually through 2004.

In 2009, a Long Term Monitoring Optimization (LTMO) analysis of the groundwater data was performed and the results showed that attenuation was occurring at this site and there was no evidence of contaminant migration. Stable and decreasing trends for benzene and DRO in individual wells were identified and a first-order attenuation rate analysis indicated that the benzene contamination would likely persist at the site for a significant period of time. Based on these results, a treatability study using ISCO was conducted in October 2010 as an attempt to reduce the residual benzene concentrations. Several rounds of groundwater monitoring were conducted between November 2010 and September 2011 to evaluate the effectiveness of the treatability study.

Currently, three monitoring wells located along the southern boundary of the site are sampled annually.

Institutional Controls

ICs at the site include restrictions on well installations until state and federal MCLs are met. Since there is no surface contamination at the Building 1168 Leach Well site, access to the area for non-intrusive activities is unrestricted.

ICs are inspected annually and a summary of the survey and corrective actions taken are presented in an annual IC report. The first annual report was prepared for 2012 (FES 2013h) and prior IC inspections were included in the OU-specific annual monitoring reports. IC inspections evaluate potential land use changes, site security (monitoring wells, etc., as applicable), or unauthorized groundwater use. Reviews of the FWA IC GIS layer and the site-specific information in the ADEC Contaminated Sites database are also conducted.

5.2.2.3 Operation, Maintenance and Monitoring

The AS/SVE system was decommissioned in 2003. Since that time, groundwater sampling has been conducted annually. Currently, three wells (AP-5751, AP-6809, and AP-10037) are sampled for ROD COCs, as well as GRO, DRO, residual range organics (RRO), and geochemistry parameters.

5.2.3 Progress Since Last Five-Year Review

The Third Five-Year Review Report (U.S. Army 2011) provided the following protectiveness statement for the OU-2 Building 1168 Leach Well Site:

> *"The remedy at OU2 has been implemented and is protective of human health and the environment. The remedy is relying upon Monitored Natural Attenuation (MNA) to achieve final cleanup goals in groundwater over time, and in the interim, exposure pathways that could result in unacceptable risks are being controlled and Institutional Controls are preventing exposure to, or ingestion of, contaminated groundwater."*

The following recommendations were provided in the Third Five-Year Review Report:

- The current site model indicates that contamination does not appear to be migrating off-site and continued groundwater monitoring should be sufficient to ensure protectiveness.
- Continue evaluation of the ISCO treatability study and conduct additional injections if necessary.
- Perform post-wide IC inspection and evaluate protectiveness. Update restricted use boundaries in GIS as new information becomes available.
- Develop the parameters for an Annual Report of IC effectiveness and corrective actions taken (spring 2012 milestone date).
- Update the database of LUC/IC summary documents (October 2013 milestone date), which consists of tables that describes in greater detail the ICs, the objectives to be met by the restrictions, and any specific restrictions, controls, and mechanisms.

The status of these recommendations and actions taken to address them are discussed below.

- Groundwater samples have been collected from the site annually since the previous five-year review. During each annual monitoring event, groundwater data from three monitoring wells was presented in annual monitoring reports and used to perform LTMO analysis, which included evaluations of contaminant trends, plume stability, monitoring well redundancy, and sampling frequency using Monitoring and Remediation Optimization System (MAROS) software. Beginning in 2014, the sampling data was analyzed using a groundwater statistics tool developed by the USEPA.
- A post-wide IC inspections have been performed and results were documented in annual IC reports for 2012, 2013, and 2014 (FES 2013d, 2015a, 2015f).

- Parameters for an annual report of IC effectiveness and corrective actions taken have been developed; they are used in the annual IC reports.
- Tables that describe in detail the ICs, objectives to be met by the restrictions, and any specific restrictions, controls, and mechanisms have been updated and are documented in annual IC reports for 2012, 2013, and 2014 (FES 2013d, 2015a, 2015f).

5.2.4 Site Inspection

The site was inspected by USACE on August 11, 2015 to examine the remediated areas and assess the protectiveness of the remedy. The site was forested with both mature and young trees. All wells appeared to be in good condition. A damaged bollard was observed adjacent to monitoring well AP-7143; it did not appear to affect access to the monitoring well. Site access is controlled by the installation and interior fencing was in good condition. A small amount of cardboard boxes and other household refuse were observed on the site. A completed site inspection checklist is provided in Attachment 4. Photographs are provided in Attachment 5.

FWA staff indicated that LUCs/ICs are maintained as required by the ROD. The most recent IC review of the Former Building 1168 Leach Well site documented in the preliminary draft 2014 IC report (FES 2015f) concluded:

- There was no evidence of unauthorized installation or use of groundwater wells.
- No soil disturbing activities were observed.
- Wells currently at the site are easily assessable and secured.
- Site land use and adjacent land use have not changed.

The five-year review site inspection confirmed these conclusions.

5.2.5 Data Review

Annual groundwater data collected between 2012 and 2015 was available for this five-year review. The 2015 Monitoring Report for OU-2 presents 2015 and historical groundwater analytical results and demonstrates through statistical evaluation that groundwater cleanup goals have been achieved for ROD COCs, although petroleum contamination (as DRO) persists (FES 2016e). Groundwater analytical data collected between 2010 and 2015 is provided in Attachment 10. Monitoring well locations are shown on Figure 5-2.

Annual groundwater monitoring data for the Former Building 1168 Leach Well site shows that benzene concentrations, the target of the ISCO treatability study injections, have been consistently below the site cleanup goal. Consequently, additional ISCO injections are not recommended. PCE, TCE, 1,1-DCE, cis-1,2-DCE, and vinyl chloride have also been consistently below the site cleanup goals. The 2015 monitoring report recommended eliminating VOC analyses from the monitoring program and transferring the site to the 2-PTY Program, which has been approved by the USEPA. The five-year review concurs with this recommendation.

5.2.6 Technical Assessment

5.2.6.1 Question A

Is the Remedy Functioning as Intended by the Decision Document?

Yes, the remedy is functioning as intended by the ROD. The estimated time frame to achieve the cleanup goals was 15 years. Groundwater cleanup goals for ROD COCs were achieved after four years of AS/SVE system operation. Groundwater monitoring following completion of the active remediation showed that benzene concentrations had rebounded, triggering an ISCO treatability study in 2010. Annual groundwater data collected since the ISCO treatability study indicate that the benzene concentrations, as well as other COCs, have been consistently below the cleanup goals.

ICs are in effect and no violations have been reported since the previous five-year review. The five-year review concurs with the recommendation to eliminate VOC analyses and transfer the site to the 2-PTY Program.

No early indicators of potential problems were identified.

5.2.6.2 Question B

Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Still Valid?

Yes, the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy are still valid. The current exposures and major exposure assumptions for future potential land use at the site have not changed. Attachment 8 evaluates the potential for vapor intrusion at the site, since it was not previously evaluated. USEPA and ADEC guidance on vapor intrusion has either been developed or has been significantly updated within the last five years.

None of the cleanup goals are risk-based. There are no new or newly promulgated requirements of federal and state environmental laws that would change the protectiveness of the remedy implemented at the site.

The exposure assumptions used at the time of the remedy for protection of human health remain valid. The vapor intrusion pathway was not explicitly evaluated at OU-2 at the time of the ROD. The current VOC concentrations in groundwater do not exceed VISLs and vapor intrusion should not be a concern at the neighboring residential housing units.

A screening level ecological risk assessment indicated that no complete ecological exposure pathways existed at the Building 1168 Leach Well site. Nothing has changed at the site that would change this assessment.

5.2.6.3 Question C

Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No information has come to light that could call into question the protectiveness of the remedy for the intended use of the property as described in the ROD; however, the USEPA has identified 1,4-dioxane as an emerging contaminant.

An assessment has not been performed at the OU-2 Building 1168 Leach Well site to evaluate whether a release of the stabilizer 1,4-dioxane occurred. A recommendation to perform sampling is included below; however, this issue is not anticipated to affect protectiveness based on the following information:

- LUCs/ICs have been implemented preventing receptors from direct contact with subsurface contaminants at the OU-2 Building 1168 Leach Well site.
- A hypothetical USEPA VISL was calculated for 1,4-dioxane (530,000 µg/L). This value is over four orders of magnitude greater than a VISL calculated for TCE under the same conditions (15 µg/L). ADEC does not have a VISL for 1,4-dioxane (VISL for TCE in groundwater is 5.2 µg/L). Based on this information, 1,4-dioxane should not pose a risk via vapor intrusion where no risk is identified for TCE.
- Groundwater contaminant concentrations at the site are relatively low.
- The closest drinking water supplies include:
    - The Golden Heart Utilities has four water supply wells (AK2310730 - community) located 2.1 miles from the OU-2 Building 1168 Leach Well on the banks of the Chena River. These wells are separated from the OU-2 Building 1168 Leach Well by a hydrogeologic divide (Chena River).
    - The system operator was contacted on 27 October 2016 to request monitoring data for 1,4-dioxane as required for this system under the Unregulated Contaminant Monitoring Rule 3 (UCMR3). The operator indicated that the system was sampled for 1,4-dioxane twice in 2013 (February and August), however, the sampling point was at the entry point to the distribution system (post-treatment). The results indicate that no 1,4-dioxane was detected in the water samples at concentrations above the laboratory's minimum reporting limit of <0.07 µg/L. No raw water quality data was available for 1,4-dioxane.
    - Pioneer drinking water wells (AK2310730 - community) for the Hamilton Subdivision are located approximately 0.7 miles from the OU-2 Building 1168 Leach Well (see Figure 3-1). These wells are unlikely to be influenced by the OU-2 Building 1168 Leach Well due to the distance of separation and low contaminant concentrations.
    - FWA has eight on-post wells (AK2310918 - community) and one well servicing the golf course (AK2311095 - non-community). In addition to those wells identified by the State, an emergency water supply well is located within the OU-2 DRMO Yard (see Section 5.3). The well locations are depicted on Figure 3-1. Only one well located on FWA is currently designated as a drinking water source (Building 3559 Water Well). This well is separated from the OU-2 Building 1168 Leach Well by a hydrogeologic divide (Chena River).
- The OU-2 Building 1168 Leach Well is located approximately 0.4 mile west of the Chena River. Based on the distance of separation and low contaminant concentrations, it is unlikely that impacts associated with the Leach Well would impact the Chena River.
- No other sensitive receptors were identified.

5.2.6.4 Technical Assessment Summary

The remedy at the Building 1168 Leach Well site was fully implemented in 1997. Monitoring data indicates that the cleanup goals have been attained. No changes in ARARs or the risk assessment were identified that would affect the protectiveness of the remedy. No sampling for 1,4-dioxane has been completed at the Building 1168 Leach Well site. This issue is discussed below with a corresponding recommendation.

5.2.7 Issues

The following issue was identified at the Building 1168 Leach Well site that may affect the long-term protectiveness of the remedy:

- An assessment for 1,4-dioxane has not been performed at the Building 1168 Leach Well site and DRMO Yard.

The following issue was identified that does not affect the protectiveness of the Building 1168 Leach Well site:

- All cleanup goals identified in the OU-2 ROD have been attained, although petroleum contamination persists at the site.

The following site-wide concern was identified that does not affect the protectiveness of the FWA remedies:

- The site-wide SOP does not include documentation and information regarding all LUCs required throughout FWA.

5.2.8 Recommendations for Follow-up Actions

The following recommendation is made for the issue that affects protectiveness at FWA:

- Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the Building 1168 Leach Well and DRMO sites. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.

The following recommendation is made for the issue that does not affect protectiveness at the Building 1168 Leach Well site:

- An iRACR should be completed to document remedial action complete under CERCLA.

The following site-wide recommendation was identified that does not affect the protectiveness of the FWA remedies:

- The U.S. Army should develop a revised site-wide IC program to include LUC/IC requirements. This will be initiated in November 2016 with a planned completion date of September 2018.

5.2.9 Protectiveness Statement

The remedy at the OU-2 Building 1168 Leach Well site currently protects human health and the environment because:

- All cleanup goals identified in the ROD have been attained, although petroleum contamination persists at the site.

- ICs are in-place to ensure that groundwater containing petroleum contaminants will not be used.

However, in order for the remedy to be protective in the long-term, the following action needs to be taken to ensure protectiveness:

- Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the Building 1168 Leach Well site. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.

5.3 OU-2 DRMO Yard

5.3.1 Background Information

The DRMO Yard is composed of six subareas. Two subareas, a portion of DRMO-1 and DRMO-4, are being remediated under CERCLA and included in this five-year review. The remaining subareas are managed under the 2-PTY agreement between the U.S. Army and ADEC and are exempt from CERCLA; one subarea was granted no further action. The location of the DRMO Yard is shown on Figure 2-1 and subareas are illustrated on Figure 5-3.

The DRMO-1 subarea covers the central and northwest portions of the DRMO Yard, including Building 5008, a Water Supply Well House, and a large area to the northwest. The DRMO-4 subarea encompasses the southwest section of the DRMO Yard, which includes an Alaska Railroad spur line that enters the yard and an associated loading ramp. A portion of the Alaska Railroad line and the Old Richardson Highway are south of the DRMO Yard.

5.3.1.1 Physical Characteristics

The DRMO Yard is approximately 25 acres and located along the eastern border of FWA. The yard is bordered by the Alaska Railroad to the south, a man-made channel (Channel B) of the Chena River Flood Control Project to the west, and Badger Road to the east. Fencing surrounds the yard. No endangered or threatened species reside in the area.

Surface soil is characterized as fill material, 3 ft to 6 ft deep, consisting of silt, silty sands, and gravels. Subsurface soil is variable and consists of layers of silty sand, gravel, silt, and alluvial deposits of sand and gravel.

Groundwater is encountered at approximately 7½ ft bgs in an unconfined aquifer consisting of poorly graded, coarse-grained sand and gravel. Groundwater flow is generally toward the northwest following the regional flow of the Tanana River Valley. At the western boundary of the DRMO Yard there may be some minor short term influences by water level fluctuations in Channel B, which was constructed as part of the Chena River flood control project that connects the Chena and Tanana Rivers.

5.3.1.2 Land and Resource Use

The DRMO Yard was used to store obsolete, surplus, and unserviceable equipment and supplies for transfer to another authorized user, for public auctions, or for destruction and disposal. The yard contained numerous aisles of surplus appliances, tires, transformers, and wire. It formerly served as the hazardous material transfer point for FWA, Fort Greely, and Eielson Air Force Base. A portion of the DRMO Yard is presently used to store vehicles and equipment for troop mobilization and connexes for left-behind equipment. The land use is currently industrial and is expected to remain industrial for the foreseeable future.

Residential areas are located near the DRMO Yard approximately 1,000 ft to the northeast and 400 ft to the southeast. Residents in these subdivisions use groundwater as a drinking water source. Private wells are located upgradient of the DRMO Yard in the same unconfined aquifer as contaminated groundwater. Although groundwater generally flows west to northwest, away from these residential areas, fluctuations in flow direction occur.

In 1996, a potable water supply (Class C)/fire suppression well was installed to a depth of 102 ft in the DRMO Yard. It was located 50 ft upgradient of a defined solvent plume and 100 ft downgradient of a defined petroleum plume. Groundwater pumped from this well is treated with activated carbon, potassium permanganate addition, filtration, and chlorination prior to distribution to users. The water supply well system is housed in Building 5009 and has been sampled as part of a DRMO-1 2-PTY annual monitoring program. It is sampled six times a year for VOCs (CH2M HILL 2004b). In accordance with the ROD, the water supply well is limited to a pumping rate of 60 gallons per minute, until MCLs are achieved, to reduce the chance of drawing the plume into well's cone of influence. Use of the water supply well to fill a fire suppression storage tank is prohibited except for emergencies. The tank was initially filled by a water supply truck. Groundwater use is considered to be residential.

5.3.1.3 History of Contamination

DRMO-1

No discrete sources of contamination were identified for petroleum hydrocarbons and chlorinated solvents that have been detected in soil and groundwater at the site. The sources of contamination are believed to have been spills and releases from waste oil drums and transformers previously stored in this area, as well as former diesel USTs. A chlorinated solvent spill area is located generally north of a petroleum source area.

DRMO-4

Transformer and asphalt drum storage areas were located in DRMO-4. Near-surface contamination may have resulted from miscellaneous releases associated with the Alaska Railroad rail spur. Subsurface contamination near the water table at locations where surface contaminant levels are minimal suggests possible releases from an unidentified UST or fuel line or an undetected surface release adjacent to the area.

5.3.1.4 Initial Response

No pre-ROD cleanup activities or response actions were performed at the OU-2 DRMO Yard.

5.3.1.5 Basis for Taking Action

DRMO-1

The RI performed in 1995 concluded that petroleum hydrocarbons detected in soil at 6 to 11 ft bgs had impacted groundwater. A dissolved petroleum hydrocarbon plume was found to have migrated in the direction of groundwater flow (northwest) and extended from the suspected source area to beyond the northwest corner of the DRMO Yard. The RI also reported a chlorinated VOC plume that extended from approximately 7 ft bgs (depth to groundwater) to 30 to 40 ft bgs.

DRMO-4

Petroleum and chlorinated VOCs were detected in the groundwater at DRMO-4, although the plume was smaller and contaminant concentrations lower than at DRMO-1.

Based on the results of a baseline risk assessment, COCs for both DRMO-1 and DRMO-4 were identified in the ROD. They are presented in Table 5-6.

Table 5-6 OU-2 Former DRMO Yard COCs

Medium	COC
Groundwater	Benzene
	PCE
	TCE
	1,1-DCE
	cis-1,2-DCE
	Vinyl chloride
Soil	DRO

5.3.2 Remedial Actions

5.3.2.1 Remedy Selection

RAOs established in the January 1997 ROD (U.S. Army 1997a) are listed below.

Groundwater

- Restore groundwater to its beneficial use of drinking water quality within a reasonable time frame through source control.
- Reduce or prevent further migration of contaminated groundwater from the source areas.
- Prevent use of groundwater containing contaminants at levels above SDWA and State of Alaska Drinking Water Standard MCLs and AWQS.
- Use natural attenuation to attain AWQS (18 AAC 70) after reaching state and federal MCLs.

Soil

The RAO for soil at DRMO-1 and DRMO-4 is to prevent migration of soil contaminants to groundwater, which could result in groundwater contamination and exceedances of state and federal MCLs and AWQS (18 AAC 70).

The cleanup goals identified in the ROD for COCs in groundwater and soil are presented in Table 5-7.

Table 5-7 OU-2 Former DRMO Yard COC Cleanup Goals

Media	COC	Cleanup Goal	Basis [1]
Groundwater	Benzene	5 µg/L	MCL
	PCE	5 µg/L	MCL
	TCE	5 µg/L	MCL
	1-1-DCE	7 µg/L	MCL
	cis-1,2-DCE	70 µg/L	MCL
	Vinyl chloride	2 µg/L	MCL
Soil	DRO	100 mg/kg	ADEC 18 AAC 78

Notes:

1 Groundwater cleanup goals are based on federal and state drinking water MCLs

2 ADEC soil matrix concentrations will be considered as a guidance for in situ treatment of soils

In order to achieve these RAOs, the following remedies were selected:

DRMO-1

- *In-situ* treatment of groundwater via AS to remove VOCs.
- *In-situ* treatment of soil via SVE to prevent contaminated soil from acting as an ongoing source of contamination to groundwater.
- Evaluation and modification of the AS/SVE system, as necessary, to optimize effectiveness.
- Periodic monitoring and evaluation of air emissions from the AS/SVE system to meet air emission requirements.
- Periodic groundwater monitoring and off-gas measurements to determine attainment of RAOs.
- Achieve AWQS through natural attenuation after active treatment attains state and federal MCLs.
- Maintain ICs, including restricted access, well development restrictions and prohibition against refilling fire suppression water tank from the on-site well, as long as hazardous substances remain onsite at levels that preclude unlimited use and unrestricted exposure.

DRMO-4

- Natural attenuation
- Groundwater monitoring
- Maintain ICs, including restricted access, well development restrictions and prohibition against refilling fire suppression water tank from the on-site well, as long as hazardous substances remain onsite at levels that preclude unlimited use and unrestricted exposure.

The ROD assumed that groundwater would be restored to its beneficial use within 15 years from implementation of the remedy (U.S. Army 1997a).

5.3.2.2 Remedy Implementation

DRMO-1

The AS/SVE system was installed at the DRMO-1 source area in the summer of 1997. It was designed to operate seasonally (May through October) and was operated from 1997 to 2005. The AS system was operated continuously in 2004 and 2005. In 2005, the AS wells were rehabilitated to improve air flow through the soil but PCE removal rates remained low. As a result of declining PCE removal rates and concerns that operation of the system may have been inhibiting anaerobic biodegradation of chlorinated compounds, the RPMs decided to shut down the AS/SVE system in 2005. Between 2006 and 2008, contaminant concentrations in groundwater were slightly above the cleanup goals. It was determined that the increase in contaminant concentrations did not reflect rebound conditions that can occur following the shutdown of the treatment system. The system was decommissioned in October 2008.

A LTMO analysis completed in 2008 included an evaluation of contaminant trends, plume stability, monitoring well redundancy, and sampling frequency. Results indicated that the contaminant plumes were either stable or decreasing, thereby allowing for reductions in the monitoring program. Sampling frequency was reduced from semi-annual to annual and several wells were eliminated from the monitoring network in 2009.

The LTMO analysis also indicated that COC concentrations could exceed cleanup goals for a significant period of time. Consequently, a treatability study was conducted to stimulate reductive dechlorination and achieve remedial goals in a shorter timeframe. The treatability study was completed during 2009 and consisted of the injection of an ISCR compound, zero valent iron with a fibrous organic material. Ten months following injection, contaminant concentrations were observed to decrease to their lowest levels; however, groundwater geochemistry indicated that groundwater conditions were returning to pre-injection conditions. Consequently, a second injection was completed in 2010.

DRMO-4

Groundwater monitoring is performed at DRMO-4 to assess the progress of natural attenuation. Monitoring data collected through 2009 showed that PCE concentrations remained above the cleanup goal and a decision was made to conduct a treatability study using the same ISCR product applied at DRMO-1. The first injection was completed in 2009. PCE concentrations immediately following the injection increased to their highest concentration since the fall 2007. Following this initial increase, the concentrations decreased and remained below the cleanup goal through the October 2010 sampling event. A second injection was performed in 2011.

DRMO-1 and DRMO-4

ICs at DRMO-1 and DRMO-4 include restrictions on groundwater well installations, site access restrictions, and maintenance of fencing at the DRMO Yard until state and federal MCLs are met. Controlled access on the east side of the DRMO Yard is maintained by the operators of the DRMO facility, and controlled access from the west side of the site is maintained by the "Left-Behind Equipment" Group. Additional ICs include a limitation on refilling the DRMO Yard fire suppression water tank from the existing potable water supply well until state and federal MCLs are met (except in emergency situations).

ICs at each OU are inspected annually and a complete summary of the survey and corrective actions taken are presented in an annual IC report. The first annual report was prepared for 2012 (FES 2013h) and prior inspections were included in OU-specific annual monitoring reports. IC inspections evaluate potential land use changes, site security (monitoring wells, etc., as applicable), and unauthorized groundwater use. In addition, reviews of the FWA IC GIS layer and the site-specific information in the ADEC Contaminated Sites database are conducted.

5.3.2.3 Operation, Maintenance and Monitoring

There are no active remediation systems operating at the site and maintenance activities are limited to monitoring well inspections. During the annual groundwater sampling events, monitoring wells are inspected to ensure that they are accessible, locked, and in good condition. Results of the inspections are presented in the annual monitoring reports. Over the last several years, maintenance activities have included replacing well locks and adjusting well risers that were impacted by frost.

Currently, seven wells at DRMO-1 (AP-7559, AP-7560, AP-8914R, AP-10015, AP-10016, AP-10017, and AP-10018) and three wells at DRMO-4 (AP-8916, Probe B, and PO5) are monitored annually for ROD groundwater COCs as well as DRO, RRO, and geochemistry parameters.

5.3.3 Progress Since the Last Five-Year Review

The Third Five-Year Review Report (U.S. Army 2011) provided the following protectiveness statement for the OU-2 Former DRMO Yard:

> *"Remedies at OU3 are currently protective of human health and the environment; however, in order for the remedies to remain protective in the long-term, the Army will initiate appropriate responses in cooperation with the EPA and State of Alaska if future monitoring indicate significant changes from the current status of the contaminant plumes that would adversely affect human health and the environment. In the interim, exposure pathways that could result in unacceptable risks are being controlled and Institutional Controls are preventing exposure to, or ingestion of, contaminated groundwater."*

The following recommendations were provided in the Third Five-Year Review Report:

- The current site model indicates that contamination does not appear to be migrating off-site and continued groundwater monitoring should be sufficient to ensure protectiveness.
- Continue evaluation of the ISCR treatability study and conduct additional injections if necessary.
- Perform post-wide IC inspection and evaluate protectiveness. Update restricted use boundaries in GIS as new information becomes available.
- Develop the parameters for an Annual Report of IC effectiveness and corrective actions taken (spring 2012 milestone date).
- Update the database of LUC/IC summary documents (October 2013 milestone date), which consists of tables that describe in greater detail the ICs, the objectives to be met by the restrictions, and any specific restrictions, controls, and mechanisms.

The status of these recommendations and actions taken to address them are discussed below.

- Groundwater samples have been collected from the site annually since the previous five-year review. Groundwater analytical data from 2012, 2013, 2014, and 2015 were available for this five-year review.
- Following each annual monitoring event, groundwater data were presented in annual monitoring reports and used to perform a LTMO analysis, which included evaluation of contaminant trends, plume stability, monitoring well redundancy, and sampling frequency using MAROS software. As a result of this evaluation, a second ISCR injection was completed in 2011 in the DRMO-4 subarea as part of the treatability study initiated in 2009. In addition, beginning in 2014, the sampling data was analyzed using a Groundwater Statistics Tool developed by the USEPA.
- Post-wide IC inspections have been performed and results were documented in annual IC reports prepared for 2012, 2013, and 2014 (FES 2013h, 2015a, 2015f).
- Parameters for an annual report of IC effectiveness and corrective actions taken have been developed; they are used in the annual IC reports.

- Tables that describe in detail the ICs, objectives to be met by the restrictions, and any specific restrictions, controls, and mechanisms were updated and documented in annual IC reports prepared for 2012, 2013, and 2014 (FES 2013d, 2015a, 2015f).

5.3.4 Site Inspection

The DRMO Yard was inspected by USACE on August 11, 2015 to examine the remediated areas and assess protectiveness of the remedy. The site appeared to be used as a staging area with some structures, paved, gravel covered, and vegetated areas. Some of the probe points appeared to be frost-jacked; however, installation staff noted that sampled wells were not affected. Monitoring wells were locked and in good condition. Site access is controlled by the installation perimeter fence and fencing around the DRMO Yard. Both fences were in good condition. Completed site inspection checklists are provided in Attachment 4 and site photographs are provided in Attachment 5. FWA staff indicated that LUCs/ICs are maintained as required by the ROD.

The most recent IC review of the OU-2 DRMO Yard is documented in the 2014 IC report (FES 2015e), which concluded that:

- There was no evidence of unauthorized installation or use of groundwater wells.
- No soil disturbing activities were observed.
- A portion of the fence (northwest of the site, toward the center) appeared to be dented but was not breached.
- Wells currently at the site are easily assessable and secured.
- Land use at the site and adjacent areas has not changed.

The five-year review site inspection confirmed these conclusions. The 2012 Monitoring Report (FES 2013d) indicated that a fire suppression tank was refilled in August 2012 using the DRMO Yard potable water supply well, which is sampled for benzene and DRO as part of the 2-PTY DRMO Yard monitoring program. Since sampling began in 1998, benzene has not been detected above the ROD cleanup goal and DRO has not been detected above the 2-PTY Agreement cleanup goal.

5.3.5 Data Review

The 2015 Monitoring Report for OU-2 (FES 2016d) evaluated the latest groundwater analytical results and presented the following conclusions and recommendations:

- Overall groundwater flow direction was northwest, consistent with the regional groundwater flow pattern.
- PCE concentrations exceeded the cleanup goals in two wells, one located in DRMO-1 source area (AP-10016) and one in DRMO-4 (PO5). The exceedances at AP-10016 were attributed to high water levels that may have caused contaminants on the soil to desorb to groundwater. The high water levels correlate with above average precipitation in July and August 2015 and do not appear to be a trend at the DRMO Yard.
- The presence of PCE degradation products was interpreted to indicate that biodegradation was occurring at the sites. Reduced total organic carbon concentrations, an indicator of the injected substrate, to near background levels was interpreted to indicate that the substrate had been exhausted.

- LTMO analysis concluded that annual sampling should continue to evaluate groundwater geochemistry and contaminant concentration trends.

Groundwater analytical data collected between 2010 and 2015 is provided in Attachment 10. Monitoring well locations are shown on Figure 5-3.

DRMO-1

Eight years of AS/SVE system operation followed by two rounds of ISCR treatability study injections have reduced the COC concentrations in groundwater. The most recent groundwater data collected in 2015 showed PCE exceeding the cleanup goal in one well (AP-10016) at the DRMO-1 injection area. No other COCs exceed the cleanup goals at DRMO-1. Statistical trend analysis results presented in the 2015 Monitoring Report for OU-2 (FES 2016d) are summarized below (wells with exceedances are bolded):

- PCE
    - Increasing trend in well AP-10017 (upgradient)
    - Stable trend in well AP-7559 (downgradient)
    - No trend in wells **AP-10016** (source area), AP-7560 (downgradient), and AP-10015 (downgradient)
    - Decreasing trend in wells AP-8914R and AP-10018 (both source area)
- TCE
    - Increasing trend in wells AP-10017 (upgradient), AP-8914R (source area), and AP-10016 (source area)
    - No trend in wells AP-7559 and AP-10015 (both downgradient)
    - Stable trend in AP-10018 (source area)
    - Potentially decreasing trend in AP-7560 (downgradient)

A spatial moment analysis was performed for the PCE plume at DRMO-1 in the 2015 groundwater monitoring report. The analysis determined the following:

- The PCE dissolved mass has been variable and exhibited no trend. However, the dissolved mass estimate decreased by one third since 2014.
- The center of mass of PCE exhibited an increasing trend, and appears to have shifted downgradient of the source in recent sampling events. These results do not indicate that the plume is migrating, but are significant source area concentration decreases resulting from the treatability study and table, low-level downgradient concentrations.
- PCE trends were stable in the direction of groundwater flow, and no trend perpendicular to groundwater flow.
- There were no cleanup goal exceedances for TCE in 2015, but PCE exceeded the cleanup goal in one well near the source area. These results show there is no evidence of plume spread with concentrations above the cleanup goal in DRMO-1.

Benzene, PCE, 1,1-DCE, cis 1,2-DCE, and vinyl chloride concentrations in wells downgradient of the source area (AP-7559 and AP-7560) have remained below the cleanup goals, indicating that the plumes are not expanding. Increasing trends were identified for PCE and TCE at well AP-10017 located upgradient to the plume center (just 60 ft east of AP-10016). The PCE and TCE concentrations have been below cleanup goals for the last five years of sampling. The PCE concentration was 1.3 µg/L in August 2015 and the TCE concentration was non-detect. Increasing TCE concentrations were also detected at source area well AP-8914R, also below cleanup goals. Given how low the PCE concentrations are at AP-10016 (equal to or less than 2.0 µg/L since 2011), and that increasing TCE concentrations may be expected with reductive dechlorination, these increasing trends do not present cause for concern over remedy performance or upgradient source area(s).

Petroleum contamination (evidenced by elevated DRO concentrations) were also detected in DRMO-1 (specifically in monitoring well AP-7560); however, DRO was not selected as a groundwater COC in the OU-2 DRMO Yard ROD.

Geochemical data indicates that iron and sulfate-reducing conditions were present during the August 2015 monitoring event. Reducing conditions were stimulated by the ISCR treatability study injections. The greatest reducing conditions were observed at wells AP-8914R and AP-10018, which correspond to the highest density of injection points. Iron and sulfate reducing areas mapped in the 2015 monitoring report and are presented in Attachment 10 (Figure 3-2, *Approximate Regions of Reduced Groundwater Geochemistry*). Total organic carbon and alkalinity data indicate that the ISCR substrate was exhausted when the 2015 monitoring event was performed.

DRMO-4

Natural attenuation and two rounds of ISCR treatability study injections have caused the PCE concentrations to fluctuate above and below the cleanup goal in two of the three wells monitored. Statistical trend analysis results presented in the 2015 Monitoring Report for OU-2 (FES 2015m) are summarized below (wells with exceedances are bolded):

- PCE
  - No trend in well **PO5** (source area)
  - Stable trend in wells AP-8916 (source area) and Probe B (downgradient)
- TCE
  - Potentially increasing in well PO5 (source area)
  - Stable in well Probe B (downgradient)
  - Potentially decreasing in well AP-8916 (source area)

All COC concentrations in downgradient well Probe B have remained below the cleanup goals, indicating that the plumes are not expanding. Geochemical data indicates that reducing conditions were present in the source area and mildly reducing at downgradient well Probe B during the August 2015 monitoring event. A potentially increasing trend in TCE was identified in source area well PO5. The concentrations of TCE remain below the cleanup goal and may increase with reductive dechlorination. This potentially increasing trend does not adversely affect the remedy performance evaluation.

The five-year review reviewed the data and analysis presented in the 2015 monitoring report and agrees with the conclusions provided in the report.

5.3.6 Technical Assessment

5.3.6.1 Question A

Is the Remedy Functioning as Intended by the Decision Document?

Yes, the remedy is functioning as intended by the ROD.

Although the remedy is taking longer than the 15 years assumed in the ROD, groundwater data indicates that the COC plumes in the DRMO Yard are stable or decreasing. The 2015 groundwater monitoring data identified exceedances of cleanup goals at only two monitoring wells, AP-10016 in DRMO-1 (PCE at 7.2 µg/L) and PO5 at DRMO-4 (PCE at 8.56 µg/L). Groundwater geochemistry and analytical results indicate that biodegradation is occurring and will require additional time to achieve the cleanup goals. The remedial actions have prevented further migration of contaminated groundwater from the source areas. LUCs prevent the use of groundwater containing COCs above the cleanup goals.

The OU-2 ROD prohibits the refilling of the DRMO Yard fire suppression water tank from the existing DRMO Yard potable water supply until state and federal MCLs are met within the contaminant plume. The potable well was used in the past to fill the fire suppression water tank and is tested routinely to confirm that the water meets state and federal MCLs. The U.S. Army will restrict future use of the DRMO Yard potable water supply to ensure that the remedy continues to function as intended by the ROD.

LUC/ICs have been implemented and are functioning as intended. Opportunities for optimization were not identified.

No early indicators of potential problems were identified.

5.3.6.2 <u>Question B</u>

Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Still Valid?

Yes, the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy are still valid. The current exposures and major exposure assumptions for future potential land use at the site have not changed.

None of the cleanup goals are risk-based. There are no newly promulgated or modified requirements of federal and state environmental laws that would change the protectiveness of the groundwater and soil remedies implemented at the OU-2 DRMO Yard.

The vapor intrusion pathway was not explicitly evaluated at OU-2 at the time of the ROD. USEPA and ADEC guidance on vapor intrusion has either been developed or significantly updated within the last five years. Attachment 8 evaluates the potential for vapor intrusion at the site. The current VOC concentrations in groundwater do not exceed their VISLs and vapor intrusion should not be a concern at commercial buildings in the DMRO Yard or at the neighboring residential housing units.

A screening level ecological risk assessment was performed for OU-2; it concluded that there did not appear to be unacceptable potential ecological risks associated with the DRMO Yard source area. Nothing has changed at OU-2 that would invalidate these conclusions.

5.3.6.3 <u>Question C</u>

Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No information has come to light that could call into question the protectiveness of the remedy for the intended use of the property as described in the ROD. However, the USEPA has identified 1,4-dioxane as an emerging contaminant.

An assessment has not been performed at the OU-2 DRMO Yard to evaluate whether a release of the stabilizer 1,4-dioxane occurred. A recommendation to perform sampling is included below; however, this issue is not anticipated to affect protectiveness based on the following information:

- LUCs/ICs have been implemented preventing receptors from direct contact with subsurface contaminants at the OU-2 DRMO Yard.
- A hypothetical USEPA VISL was calculated for 1,4-dioxane (530,000 µg/L). This value is over four orders of magnitude greater than a VISL calculated for TCE under the same conditions (15 µg/L). ADEC does not have a VISL for 1,4-dioxane (VISL for TCE in groundwater is 5.2 µg/L). Based on this information, 1,4-dioxane should not pose a risk via vapor intrusion where no risk is identified for TCE.
- Groundwater contaminant concentrations at the OU-2 DRMO Yard are relatively low.
- The closest drinking water supplies include:
  - The Golden Heart Utilities has four water supply wells (AK2310730 - community) located 5.1 miles from the OU-2 DRMO Yard on the banks of the Chena River. These wells are unlikely to be influenced by the OU-2 DRMO Yard due to the distance of separation and low contaminant concentrations. The system operator was contacted on 27 October 2016 to request monitoring data for 1,4-dioxane as required for this system under the Unregulated Contaminant Monitoring Rule 3 (UCMR3). The operator indicated that the system was sampled for 1,4-dioxane twice in 2013 (February and August). However, the sampling point was at the entry point to the distribution system (post-treatment). The results indicate that no 1,4-dioxane was detected in the water samples at concentrations above the laboratory's minimum reporting limit of <0.07 µg/L. No raw water quality data was available for 1,4-dioxane.
  - Pioneer drinking water wells (AK2310714 - community) for the Hamilton Subdivision are located approximately 4.0 miles from the OU-2 DRMO Yard (see Figure 3-1). These wells are separated from the DRMO Yard by a hydrogeologic divide (Chena River). FWA has eight on-post wells (AK2310918 - community) and one well servicing the golf course (AK2311095 - non-community). In addition to those wells identified by the State, an emergency water supply well is located within the OU-2 DRMO Yard (see Section 5.3). The well locations are depicted on Figure 3-1. Only one well located on FWA is currently designated as a drinking water source (Building 3559 Water Well). This well is located approximately two miles west of the DRMO Yard. Based on the distance of separation and low contaminant levels at the DRMO Yard, the drinking water supply is unlikely to be influenced by impacts at the DRMO Yard.
- The OU-2 DRMO Yard is located approximately 1 mile south of the Chena River. Based on the distance of separation, groundwater flow direction, and low contaminant concentrations, it is unlikely that impacts associated with the DRMO Yard would impact the Chena River.
- No other sensitive receptors were identified.

5.3.6.4 Technical Assessment Summary

DRMO-1

The AS/SVE remedy at DRMO-1 was implemented in 1997 and shut down in 2005. The estimated timeframe to achieve the groundwater cleanup goals has passed; however, only one ROD-listed COC (PCE) exceeded the cleanup goal in 2015 at one sampling location (source area well AP-10016). All other COCs have been below the cleanup goals. Increasing trends in PCE and TCE were observed in well AP-10017. The PCE and TCE concentrations have been below the cleanup goals at this location, and do not affect the protectiveness of the remedy. The concentrations of PCE at monitoring well AP-10016 (where an exceedance of the cleanup goal was detected in 2015) demonstrated no trend. ICs were implemented and are maintained at DRMO-1 mitigating risk posed by receptors exposure to groundwater. No changes in ARARs or the risk assessment were identified that would affect the protectiveness of the remedy.

DRMO-4

Groundwater monitoring has been performed at DRMO-4 since the ROD was issued in 1997 (i.e. start of the remedial action). PCE concentrations have fluctuated above and below the site cleanup goals in two of three wells sampled; the estimated time frame to achieve the groundwater cleanup goals has passed. Increasing trends are not identified for PCE. Potentially increasing trends in TCE concentrations were identified in PO5; however, the TCE concentrations remain below the cleanup goal. The increasing trends therefore would not affect protectiveness. All other COCs have been below the site cleanup goals. ICs were implemented and are maintained at DRMO-1 mitigating risk posed by receptors exposure to groundwater. No changes in ARARs or the risk assessment were identified that would affect the protectiveness of the remedy.

5.3.7 Issues

The following issue was identified that may affect the future protectiveness of the remedy at the OU-2 DRMO Yard:

- An assessment for 1,4-dioxane has not been performed at the DRMO Yard.

The following concerns were identified that do not affect protectiveness of the remedy:

- The OU-2 ROD prohibits the refilling of the DRMO Yard fire suppression water tank from the existing DRMO Yard potable water supply until state and federal MCLs are met within the contaminant plume. The potable well was used in the past to fill the fire suppression water tank and is tested routinely to confirm that the water meets state and federal MCLs.
- Frost-jacked monitoring points were observed on site at the time of the site inspection.

The following site-wide concern was identified that does not affect the protectiveness of the FWA remedies:

- The site-wide SOP does not include documentation and information regarding all LUCs required throughout FWA.

5.3.8 Recommendations for Follow-up Actions

The following recommendation is made for follow-up actions that may affect protectiveness of the remedy:

- Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the DRMO Yard. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.

The following recommendation for a follow-up action was identified that does not affect the protectiveness of the remedy:

- The U.S. Army will restrict future use of the DRMO Yard potable water supply in accordance with the ROD.
- Frost-jacked points should be evaluated for repair or replacement in the OU-2 DRMO Yard.

The following site-wide recommendation was identified that does not affect the protectiveness of the FWA remedies:

- The U.S. Army should develop a revised site-wide IC program to include LUC/IC requirements. This will be initiated in November 2016 with a planned completion date of September 2018.

5.3.9 Protectiveness Statement

The remedy at the OU-2 DRMO Yard currently protects human health and the environment because:

- Migration of COCs in groundwater from the DRMO-1 and DRMO-4 source areas has been prevented by implementation of the remedial actions.
- ICs are in place to ensure that groundwater containing COCs will not be used.

However, in order for the remedy to remain protective in the long-term, the following action needs to be taken to ensure protectiveness:

- Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the DRMO Yard. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.

5.4 OU-3 Remedial Area 1B Birch Hill Tank Farm

5.4.1 Background Information

OU-3 Remedial Area 1B extends south from the base of Birch Hill to the Truck Fill Stand, west toward Lazelle Road, and east toward the Canadian Oil Pipeline (CANOL) service road. Remedial Area 1B is divided into seven subareas based on geographic location and differing physical characteristics. There are currently four active subareas known as:

- Former Building 1173
- Truck Fill Stand
- Thaw Channel
- BHTF Product Recovery System

The remaining subareas include Shannon Park Subdivision and CANOL Service Road, which were granted NFA RODs in 1996. The Lazelle Road sites were incorporated into the Former Building 1173 subarea in 1997. Figure 2-1 shows the location of OU-3 Remedial Area 1B and Figure 5-4 illustrates site features.

5.4.1.1 Physical Characteristics

Remedial Area 1B is located in the Chena River floodplain, which gently slopes southward and then westward at about 1.8 ft per mile. The subsurface contains discontinuous permafrost and poorly drained soils covered by thick organic mats. Surface water ponding is common throughout the area during spring melt-off, after which mid-summer conditions dry the land surface. Wetlands are scattered throughout the area and shrub and forested wetlands border the southern portion of the site. No endangered or threatened species reside in the area.

The BHTF was constructed on the southwest slope of Birch Hill, between elevations 530 ft and 725 ft, which are above the surrounding river plain and cantonment area that are approximately 450 ft in elevation. Two distinct hydrostratigraphic zones underlie the tank farm and nearby properties: 1) the Birch Creek schist bedrock aquifer located from the top of the hill to the base of the hill, which includes the area beneath the ASTs on Birch Hill; and 2) an alluvial sediment aquifer that thickens to the south and west and contains discontinuous permafrost. The alluvial aquifer underlies Former Building 1173 and the Truck Fill Stand along with the Lazelle Estates and church properties.

Birch Hill consists of loess blanketing the Birch Creek schist and deeper bedrock units. Groundwater flow in the bedrock aquifer at the BHTF occurs in secondary porosity features, such as fractures and joints. The presence, location, and extent of permafrost from the base of Birch Hill southward to the Chena River significantly affects the groundwater flow direction in this area. Groundwater occurs in two zones above and below the permafrost in the alluvial aquifer. The supra-permafrost groundwater zone is a saturated zone above permafrost, whereas sub-permafrost groundwater is a saturated zone beneath permafrost. This deeper zone is the source for most local drinking water wells.

The approximate location of permafrost is shown on Figure 5-4. Additional information, including a November 2014 groundwater contour map, is provided in Attachment 10. It shows a steep hydraulic gradient within the bedrock aquifer at Birch Hill that flattens at the base of the hill. Groundwater in the bedrock aquifer flows generally to the southwest following surface topography and changes to a more westerly direction at the base of Birch Hill. The alluvial aquifer exhibits 1) very low gradients in a southwesterly flow direction, 2) shallow groundwater flow deviations around blocks of permafrost, and 3) groundwater depths varying between 20 ft and 22 ft bgs. Development of the property to the west of BHTF may result in additional thawing of permafrost, which could cause changes in shallow groundwater flow. This condition is exemplified by a Thaw Channel area where land use changes have promoted seasonal soil heating that has permanently thawed the permafrost and created a preferential flow pathway for shallow groundwater. The flow direction arrows on a groundwater contour figure in Attachment 10 show the routing of groundwater through the Thaw Channel area.

5.4.1.2 Land and Resource Use

The current land use is considered light industrial in the remedial area and light industrial, recreational, and residential in surrounding areas. Groundwater below Remedial Area 1B is not currently a source of drinking water. The Shannon Park Baptist Church and Steese Chapel on Lazelle Road are approximately ¼ mile west and have groundwater wells; although neither of these wells are currently used for drinking water purposes. The U.S. Army currently fills a water holding tank at Shannon Park Baptist Church once a month. Bottled water was supplied to the Steese Chapel, which has been discontinued at their verbal request (exact date of this request is unknown). A reverse osmosis treatment system was installed on the Chapel supply well. The treatment system is operated and maintained by the Chapel.

Fifty-two (52) acres adjacent to the BHTF was sold in early 2006 for the Lazelle Estates residential housing development. According to the third five-year review, the development included 220 lots and 91 housing units by 2007. The most recent tax maps (accessed 27 September 2016) and Google Earth™ imagery (dated September 6, 2015) include 123 property records with 72 lots developed. The developed lots contain a mixture of single family homes and duplexes; therefore, the number of housing units is greater than the number of developed lots. The current equivalent number of housing units was not available in the public records. A portion of the Lazelle Estates originally planned for development was never completed which may account for the discrepancy between the total number of lots noted in 2007 and in 2016. The development shares a property line with FWA and housing construction is concentrated along the Steese Highway, approximately 1,000 ft from the FWA boundary. All of the housing units are on city water and volatile contaminants from the BHTF do not extend under the residential area.

5.4.1.3 History of Contamination

The BHTF was originally constructed as part of the 1943 CANOL Project that included a 3-inch pipeline from Whitehorse to Fairbanks. It originally consisted of 14 10,000-barrel, bolted-steel ASTs that contained JP-4, mogas, and diesel fuels. These tanks were connected by an 8-inch pipeline to a Railcar Off-Loading Facility (OU-3 Remedial Area 2) and the East Birch Hill UST Tank Farm near the Milepost sites (OU-3 Remedial Area 3). In 1955, as part of oil pipeline expansions, two 25,000 barrel tanks, the Truck Fill Stand, and a new pump house and manifold building were built.

Contamination in Subarea 1B was initially discovered during a 1988 soil gas survey. Subsequent investigations indicated that subsurface soils and groundwater were impacted by petroleum compounds. Fuel spills at the Truck Fill Stand, tank leaks, and operational processes employed at the Former Building 1173 subarea caused this contamination. USTs located at the base of the hill also appeared to be a contributing fuel source via spills or leaks.

The BHTF was permanently closed in January 1994. Characterization of soil and groundwater contamination at the tank farm was complicated by permafrost, which led to initially underestimating the nature and extent of contamination in this area.

In 1995, 1,2-dichloroethane (DCA) was detected in the Shannon Park Baptist Church drinking water well at concentrations slightly above the MCL. The U.S. Army began supplying drinking water to two churches, Shannon Park Baptist Church and Steese Chapel, both located downgradient of Remedial Area 1B. Concentrations of DCA in the Baptist Church well have been consistently below the MCL since 1999 and DCA concentrations in the Steese Chapel well have been consistently insignificant.

The OU-3 ROD was signed in April 1996 and subsequent studies better delineated the permafrost configuration and groundwater flow characteristics. The extent of contamination was also redefined and showed both the bedrock and alluvial aquifers were more impacted than previously estimated. Free product (weathered aviation gasoline known as AVGAS) and elevated groundwater concentrations of fuel additives DCA and 1,2-dibromoethane (EDB) indicated the presence of persistent sources in the Birch Hill bedrock aquifer.

A series of investigations indicated that dissolved contaminants measured off post were migrating in the alluvial aquifer groundwater that comes in contact with free product in bedrock fractures underlying Birch Hill. The detection of free product led to the addition of a subarea known as the Birch Hill Product Recovery System, which was documented in the 2002 ROD ESD.

5.4.1.4 Initial Response

The U.S. Army began supplying drinking water to the Shannon Park Baptist Church and Steese Chapel in 1995 due to MCL exceedances at the Baptist Church.

5.4.1.5 Basis for Taking Action

A remedy for Remedial Area 1B was necessary for the following reasons:

- Benzene was detected above SDWA levels in groundwater.
- The site was near the FWA boundary, residential drinking water wells, and a Class A public water-supply system.
- Contaminant migration from soil to groundwater was occurring.

Based on the results of a baseline risk assessment, CERCLA COCs were identified for Remedial Area 1B groundwater and presented in the 2002 ROD ESD (U.S. Army 2002). They represent fuel-related compounds and are presented in Table 5-8.

Table 5-8 OU-3 Remedial Area 1B COCs

Medium	COC
Groundwater	Benzene
	Toluene
	Ethylbenzene
	1,2-EDB
	1,2-DCA
	1,2,4-TMB
	1,3,5-TMB

Notes:
TMB trimethylbenzene

5.4.2 Remedial Actions

5.4.2.1 Remedy Selection

The following RAOs were established in the January 1996 ROD:

- Restore groundwater to drinking water quality within a reasonable time frame.
- Reduce further migration of contaminated groundwater.
- Prevent use of groundwater with contaminants at levels above SDWA standards.

A RAO for petroleum contaminated soil was established to prevent migration of contaminants from soil into groundwater that would result in groundwater contamination and exceedance of SDWA standards.

The cleanup goals identified in the ROD are presented in Table 5-9.

Table 5-9 OU-3 Remedial Area 1B COC Cleanup Goals

Media	COC	Cleanup Goal (µg/L)	Basis
Groundwater	Benzene	5	1
	Toluene	1,000	1
	Ethylbenzene	700	1
	1,2-EDB	0.05	1
	1,2-DCA	5	1
	1,2,4-TMB	1,850	2,3
	1,3,5-TMB	1,850	2,3
Soil	Soils contaminated with VOCs and petroleum-related compounds	Active remediation until contaminant levels in groundwater are consistently below state and federal MCLs	

Notes:
1 Groundwater cleanup goal based on federal and state drinking water MCLs.
2 Groundwater cleanup goal based on a RBC equivalent to a non-cancer hazard quotient of 1 using residential groundwater exposure assumptions.

3 The 2002 ESD clarified the cleanup goals for 1,2,4-TMB and 1,3,5-TMB to 1.85 milligrams per liter (mg/L). The ROD listed cleanup goals for these constituents at 0.014 mg/L and 0.012 mg/L, respectively.

The selected remedy consisted of SVE for contaminated soil and AS for contaminated groundwater in permafrost free areas to achieve SDWA levels and natural attenuation to meet AWQS.

The ROD estimated timeframe to reach the cleanup goals was no more than 30 years, or by 2026 (U.S. Army 1996b).

5.4.2.2 Remedy Implementation

AS/SVE Systems

Two AS/SVE systems were installed at OU-3: 1) near Former Building 1173 and 2) at the Truck Fill Stand. An AS system was also installed at the Thaw Channel (refer to Attachment 10, Figure 1-1). The systems were operated between 1996 and 2005 and decommissioned in 2012. Combined, they removed approximately 87,000 pounds of VOCs (82,000 pounds from Former Building 1173 and 5,300 pounds from the Truck Fill Stand) or a weight equivalent of about 14,000 gallons of gasoline. *In-situ* equipment, piping, and supporting infrastructure were removed, recycled, and disposed according to ADEC agreements and guidance. Select groundwater monitoring wells not included in the monitoring program were also decommissioned. All of the sites, besides the BHTF proper, were restored to native field conditions and hydroseeded.

These remedial actions were followed by rebound studies and performance monitoring for natural attenuation processes.

Dual-phase Free-Product Recovery System

To address the significant amounts of floating fuel product discovered at the BHTF during the 1998 field season, active and passive skimmers were installed in 1998 in various bedrock wells located on the hill (refer to Attachment 10, Figure 1-1). They were expanded in 1999 in several new wells. Between 2000 and 2003, a product recovery system operated on Birch Hill that ultimately removed approximately 5,500 gallons of fuel product from over 13 million gallons of groundwater. This source depletion decreased dissolved benzene within the bedrock aquifer and limited migration to the alluvial aquifer, thereby reducing the potential for contamination in off-post wells. In 2003, the system's efficiency declined as free-product layers thinned, so the system was shutdown. Free product is still known to exist in the fractured bedrock below BHTF area and appears to be a low-concentration source to nearby monitoring wells screened in the alluvial aquifer. The recovery system was placed in storage in 2009 and can be re-initiated if required.

Groundwater Monitoring

All treatment systems in OU-3 Remedial Area 1B have been shut down and the sites are currently undergoing natural attenuation and long-term groundwater monitoring.

Institutional Controls

ICs for OU-3 were established in the 2002 ESD, which asserted that a facility-wide IC policy established in the OU-5 ROD, U.S. Army Alaska Institutional Controls Standard Operating

Procedures (APVR-RPW [200-1]), and a February 2002 Memorandum on ICs (APVR-RPW-EV-[200-1c]) from Major General James J. Lovelace, Fort Richardson, Alaska would be used to develop, implement, and monitor site-specific IC requirements at the site (U.S. Army 2002). Since that time, FWA Garrison Policy #38 was issued (November 9, 2011), which updated and disseminated the LUC/IC Policy for FWA.

ICs are maintained to ensure that groundwater will not be used until cleanup goals are attained. They include restrictions governing site access, construction, and water supply well installation as long as hazardous substances remain on site at levels that preclude unrestricted use. Informational signs have been installed to inform the public of restrictions in this area.

Installation-wide ICs are annually inspected and any violations are corrected. Results of these activities are documented annual IC reports. The first annual report was prepared for 2012 (FES 2013h) and prior IC inspection results were included in the OU-specific annual monitoring reports.

5.4.2.3 Operation, Maintenance and Monitoring

There are no active remediation systems in Remedial Area 1B and maintenance activities are limited to monitoring well inspections. During the annual monitoring events, monitoring wells are inspected to ensure that they are accessible, locked, and in good condition. Inspection results are presented in the annual monitoring reports. Over the last several years, activities have included replacing well locks and adjusting well risers that are impacted by frost.

Groundwater monitoring throughout OU-3 occurs annually (normally in June), with some additional sampling at the Remedial Area 1B to assess contaminant trends in bedrock wells and select alluvium wells downgradient of the BHTF. A total of 27 bedrock wells and 18 alluvium wells were sampled in 2014. Groundwater samples are analyzed for ROD COCs, DRO, and geochemistry parameters. Wells are located on Birch Hill, in an area south of Birch Hill, and off-post areas (refer to Figure 5-4).

5.4.3 Progress Since the Last Five-Year Review

The Third Five-Year Review (U.S. Army 2011) provided the following protectiveness statement for OU-3:

> *"Remedies at OU3 are currently protective of human health and the environment; however, in order for the remedies to remain protective in the long-term, the Army will initiate appropriate responses in cooperation with the EPA and State of Alaska if future monitoring indicate significant changes from the current status of the contaminant plumes that would adversely affect human health and the environment. In the interim, exposure pathways that could result in unacceptable risks are being controlled and Institutional Controls are preventing exposure to, or ingestion of, contaminated groundwater."*

The following recommendations were provided in the Third Five-Year Review Report:

- Decommission AS/SVE treatment systems at Former Building 1173 and the Truck Fill Stand.
- Continue annual monitoring of Birch Hill alluvial and bedrock wells to evaluate natural attenuation. Continue to optimize the sampling frequency, location, and analysis required to achieve remedial goals by conducting LTMO analysis.

- Perform a post-wide IC inspection and evaluate protectiveness; update restricted use boundaries in GIS as new information becomes available.
- Develop the parameters for an Annual Report of IC effectiveness and corrective actions taken (spring 2012 milestone date).
- Update the database of LUC/IC summary documents (October 2013 milestone date), which consist of tables that describe in greater detail the ICs, the objectives to be met by the restrictions, and any specific restrictions, controls, and mechanisms.

The status of these recommendations and actions taken to address them are discussed below.

- The AS/SVE systems at the Former Building 1173 and the Truck Fill Stand were decommissioned in 2012.
- Groundwater sampling has been conducted annually between 2011 and 2015 and LTMO analysis has been performed on the data.
- Post-wide IC inspections have been performed and results were documented in annual IC reports prepared for 2012, 2013, and 2014 (FES 2013d, 2015a, 2015f).
- Parameters for an annual report of IC effectiveness and corrective actions taken have been developed; they are used in the annual IC reports.
- Tables that describe in detail the ICs, objectives to be met by the restrictions, and any specific restrictions, controls, and mechanisms were updated and documented in annual IC reports prepared for 2012, 2013, and 2014 (FES 2013d, 2015a, 2015f).

5.4.4 Site Inspection

The site was inspected by USACE on August 11, 2015 to examine the remediated areas and assess the protectiveness of the remedy. The site was forested and includes staging areas for remedial activities occurring on 2-PTY sites and other construction activities. All wells appeared locked and in good condition. Fuel piping was observed in the area; FWA staff noted that the piping was associated with the pipeline and not the tank farm. The AS/SVE treatment systems at Former Building 1173 and the Truck Fill Stand were decommissioned.

Evidence of historical trespassing including fencing damage (repaired) and graffiti was observed. A former product recovery building was locked and decommissioned. FWA staff noted that the removal of ASTs and fencing repairs were completed to deter trespassing. The community information sign was in good condition. Site inspection checklists are provided in Attachment 4 and site photographs are provided in Attachment 5.

FWA staff indicated that LUCs/ICs are maintained as required by the ROD.

The most recent IC review of OU-3 Remedial Area 1B is documented in the 2014 IC report (FES 2015e), which concluded that:

- There was no evidence of unauthorized installation or use of groundwater wells.
- No soil disturbing activities were observed.
- Information signs are intact.
- Wells currently at the sites are easily accessible and secured.
- Site land uses and adjacent land use have not changed.
- IC boundaries are clearly marked on the IC map and the IC database is up to date.

The five-year review site inspection confirmed these conclusions.

The IC summary presented in the preliminary draft 2015 OU-3 Monitoring Report (FES 2016b) identified several maintenance issues associated with the BHTF survey conducted in September 2015. They included one inoperable well lock (AP-7855), unsecured gates, and a breach that was present on the west side of the fence near Tank 315. According to FES, breaches are repaired as soon as they are found, may be mitigated by the removal of the ASTs formerly located at the BHTF, and AP-7855 was secured with a new lock.

5.4.5 Data Review

The 2015 sampling event detected three COCs (benzene, 1,2-DCA, and 1,2-EDB) above their cleanup goals in the bedrock aquifer. No adjacent alluvium wells exhibited contaminant concentrations exceeding the ROD cleanup goals in 2015. Groundwater data for the last five years is presented in Attachment 10. Highlights include:

- All COCs have attenuated to below the cleanup goals in the alluvial aquifer except for the following:
    - AP-10227MW: This well is located near the base of Birch Hill (Building 1173) and may reflect low level impacts from bedrock dispersion. 1,2-DCA concentrations have exceeded the cleanup goal at this location six times since 2011.
    - AP-10230MW: This well is located within the Truck Fill Stand area. EDB concentrations have exceeded the cleanup goal at this location twice since 2011 (October 2014 and April 2015).
- Six bedrock monitoring wells (including one multi-level well) located in either the Thaw Channel area or along CANOL Road exhibited benzene concentrations below the cleanup goal. Benzene was not detected in any alluvial aquifer wells or in off-post bedrock wells in the Thaw Channel. DCA has reached its cleanup goal in the Thaw Channel subarea.
- Benzene has not been detected above the MCL at the Shannon Park Baptist Church since 2007.
- The predominant area of bedrock groundwater impacts is located within the AST 316 tank berm (wells AP-7596 and AP-8783) and extends south across the Building 1182 Pump House (AP-7600) and west to the vicinity of wells AP-7594 and AP-8890. This plume includes benzene, 1,2-DCA, and 1,2-EDB cleanup goal exceedances and comingles with the free product also detected in bedrock groundwater.
- Measureable product (fuel) layers were detected in two bedrock wells. AP-7848 contained a 0.42-ft thick layer; it is located near the base of Birch Hill (generally downgradient of former tanks 302 and 316) in the Birch Hill Product Recovery area. AP-7816 contained a 0.07-ft thick layer. Free product has not been seen in the alluvial aquifer since 1997.
- The bedrock aquifer monitoring program at Birch Hill indicates the presence of significant source volume, bedrock COCs are still prevalent above the cleanup goals.
- DRO was not identified as a groundwater COC for the BHTF, but was detected at elevated concentrations in April 2015 in five alluvial wells (AP-10227MW, AP-10228MW, AP-10230MW, AP-10231MW, and AP-10234MW).

The natural attenuation of COCs in OU-3 Remedial Area 1B is progressing at slow to moderate rates. The alluvial aquifer in this area is anaerobic and exhibits elevated ferrous iron and depleted sulfate concentrations where fuel-related contamination exists or existed (refer to Attachment 10, Table 5-12). The sampling data trends, in concert with these geochemical signatures, indicate COCs are stabilizing and attenuating in the groundwater environment, albeit at a slow rate in the bedrock aquifer.

The following monitoring wells historically contained elevated concentrations of COCs above the cleanup goals but are no longer sampled:

- AP-7813: the 2014 OU-3 monitoring report recommended the sampling of well AP-8424 in lieu of AP-7813. It is located within 10 ft of AP-7528.
- AP-7528: The 2012 OU-3 monitoring program recommended that AP-7528 be removed from the sampling program due to poor recharge.

Statistical trend analysis (Mann-Kendall test) and spatial plume analysis was performed on groundwater analytical data collected through 2015 for benzene and DCA in 25 bedrock wells and 18 alluvial aquifer wells located within the Birch Hill Product Recovery area and at the base of Birch Hill (FES 2016b). This analysis was also performed for 1,2-EDB in 26 bedrock wells. Trend analysis for 1,2-EDB analysis was not performed on the alluvium wells. The results are discussed below.

Benzene

A dissolved benzene plume within the bedrock aquifer covers an estimated 126,000 square ft from the sources on Birch Hill to the base of Birch Hill. The plume continues to exhibit mass depletion and natural attenuation that is reflected in low concentrations in the alluvial aquifer (Refer to Attachment 10, Figure 2-6). Anticipated remedial timeframes vary up to 100 years according to linear data regressions. The trend and spatial plume analysis indicate the following:

- Increasing trend: two bedrock wells (AP-10226MW [1173MP] and AP-8422). These wells are located near the base of Birch Hill east of Former Building 1173.
- All remaining sampled wells with benzene concentrations exceeding ½ the cleanup goal had no trend or a decreasing benzene trend.
- The bedrock aquifer spatial moment analysis showed decreasing trends in plume mass and distance to source, but increasing trends in the plume spread (likely due to decreasing concentrations in the source areas and variable concentrations in downgradient wells).

1,2-DCA

1,2-DCA concentrations remain elevated within the bedrock aquifer and several wells exhibit increasing concentrations near the base of Birch Hill, although only one well exceeded the cleanup goal in 2015. These data indicate that dissolution of 1,2-DCA from the bedrock appears to be a low-strength source to the alluvium, where dispersion is decreasing the center mass and concentrations of the plume (Refer to Attachment 10, Figure 2-7). The trend and spatial plume analysis indicate the following:

- Increasing trend Identified in four bedrock wells with concentrations of at least ½ the cleanup goal (AP-7530, AP-10226MW [1173-MP1], AP-8422, and AP-7855 [extraction well]). Short term trends (since 2010) in three of these wells exhibit stable DCA conditions.

- The bedrock aquifer spatial moment analysis showed increasing trends in plume mass and distance to source, and increasing trends in the plume spread indicative of downgradient plume migration of DCA. However, the rate of expansion appears to be relatively slow and increasing DCA concentrations have not been recently observed in the alluvial aquifer.

1,2-EDB

1,2-EDB concentrations have generally declined in bedrock wells within the Birch Hill Product Recovery area and at the base of Birch Hill (Refer to Attachment 10, Figure 2-8). Similar to 1,2-DCA, the 1,2-EDB concentrations in some wells at the eastern base of the hill have increased, suggesting possible contaminant migration in that direction. However, except for in one well, 1,2-EDB has not been recently detected above the cleanup goal in the alluvial aquifer. The trend and spatial plume analysis indicate the following:

- Increasing trend: one bedrock well (AP-7852)
- All other wells containing 1,2-EDB concentrations of at least ½ the cleanup goal had decreasing trends.
- The 1,2-EDB concentration in source well AP-7596 increased to the highest level observed since April 2006.
- The bedrock aquifer spatial moment analysis showed decreasing and stable trends in plume mass and distance to source, respectively; but increasing trends in the plume spread (likely due to increasing concentrations in the downgradient well).

The preliminary draft of the 2015 monitoring report (final draft was not available for review) recommended the completion of a data gap analysis to evaluate contamination within the bedrock aquifer at the BHTF and to identify potential sources. The data gap analysis will be completed under the 3-PTY framework and the recommendation has been added to this five-year review. The monitoring report also recommends future actions to further characterize the area within the former AST 316 tank berm. This area was identified as the location of a "major" spill of JP-4 in the RI. Based on the contaminants identified in groundwater monitoring in this area, a release of leaded gasoline is also suspected. This recommendation will be addressed under the 2-PTY framework.

5.4.6 Technical Assessment

5.4.6.1 Question A

Is the Remedy Functioning as Intended by the Decision Document?

Yes, the remedy is functioning as intended by the 1996 ROD and 2002 ESD. The AS/SVE remedy was implemented in 1996 and terminated in 2005. A dual-phase product recovery system was installed in 1998. The ROD estimated 30 years to achieve the groundwater cleanup goals. This period has not lapsed (2026). Groundwater monitoring data indicate that prior remedial system operations and subsequent natural attenuation has reduced contaminant mass and reduced the migration of contaminated groundwater from source areas. Free product has been detected in two bedrock wells located near the base of Birch Hill and increasing trends in benzene and 1,2-DCA have been detected in this area. ICs are in place to prevent the use of contaminated groundwater on FWA and off-post consumption risks are mitigating via the attenuation of COCs in the alluvial aquifer.

Opportunities to improve performance and/or reduce costs of the monitoring were not identified. The MAROS sampling periodicity analysis should be used as a basis for any potential programmatic changes.

An early indicator of a potential problems may have been identified in groundwater quality including the persistence of free product and increasing trends in benzene and 1,2-DCE concentrations in bedrock monitoring wells.

5.4.6.2 Question B

Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Still Valid?

No, not all of the exposure assumptions, toxicity data, cleanup levels, and RAOs established at the time of the remedy remain valid. A review of the exposure assessment and toxicity criteria changes is provided in Attachment 8. The major exposure assumptions for current and future potential land use have not changed. Although potential vapor intrusion risks were not evaluated to off-site residents at the time of the remedy, groundwater concentrations at OU-3 Remedial Area 1B remain below very conservative vapor intrusion levels and vapor intrusion is not a concern.

As explained in Attachment 8, the toxicity criteria used to develop RBCs for 1,2,4-TMB and 1,3,5-TMB have been updated since the cleanup goals were identified in the 1996 ROD and then changed in the 2002 ESD. These toxicity changes do not indicate that the TMBs are more toxic now than previously assumed, so the toxicity changes do not affect the protectiveness of the remedy. However, TMBs were eliminated from the inhalation pathway during the development of the TMB cleanup goals, which was an error. The 1994 baseline risk assessment clearly considered residential inhalation of VOCs from tap water to be a complete exposure pathway, which was quantified in characterizing the baseline risk from exposure to site contaminants. Therefore, the change in risk-based cleanup goals for TMBs in the ESD was not justified; they should not have been increased by over a factor of 100. As LUCs are in place to prevent ingestion of groundwater, the remedy remains protective in the short term, but if the water is used as a source of tap water for residents, the cleanup goals may not be fully protective.

Any potential risk to ecological receptors that may occur from exposure to surface soil concentrations of lead at Remedial Area 1B are considered as part of the discussion of OU-5.

5.4.6.3 Question C

Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

5.4.6.4 Technical Assessment Summary

The AS/SVE remedy was implemented in 1996 and terminated in 2005. A dual-phase product recovery system was installed in 1998. Groundwater monitoring has been performed since the ROD was signed in 1996. All COCs have attenuated to below the cleanup goals in the alluvial aquifer with the exception of two monitoring wells. COCs are still present in the bedrock aquifer above the site cleanup goals and measurable NAPL was detected in two bedrock monitoring wells. Benzene, 1,2-DCA, and 1,2-EDB exhibit increasing trends in some of the bedrock wells. These increasing trends do not affect the protectiveness of the remedy because:

- The benzene and 1,2-EDB plume analyses showed decreasing trends in plume masses and distance to source.
- The rate of expansion of the 1,2-DCA plume appears to be slow and increasing trends in 1,2-DCA have not recently been observed in the alluvial aquifer.

These increasing trends may be an early indicator of a potential problem.

ICs have been implemented and are maintained to prevent receptor exposure to risks posed by impacted groundwater. No changes to ARARs were identified that would affect the protectiveness of the remedy. One issue was identified in the development of the TMB cleanup goal in the ESD. This issue is summarized below with a corresponding recommendation for follow-up action.

5.4.7 Issues

The following issues were identified at OU-3 Remedial Area 1B that may affect future protectiveness of the remedy:

- The inhalation pathway should not have been eliminated during development of the TMB cleanup goals in the ESD. The 1994 baseline risk assessment clearly considered residential inhalation of VOCs from tap water to be a complete exposure pathway, which was quantified in characterizing the baseline risk from exposure to site contaminants.
- The benzene and 1,2-DCA concentrations continue to exceed cleanup goals and exhibit increasing trends in some monitoring locations.

The following site-wide concern was identified that does not affect the protectiveness of the FWA remedies:

- The site-wide SOP does not include documentation and information regarding all LUCs required throughout FWA.

5.4.8 Recommendations for Follow-up Actions

The following recommendation is provided for a follow-up action at OU-3 Remedial Area 1B:

- Re-establish the cleanup goals for 1,2,4-TMB and 1,4,5-TMB in groundwater using either of the following methods:
  - Update the RBCs by including the inhalation pathway and using information from a 2016 USEPA IRIS toxicity assessment, or
  - Adopt the cleanup goals established in 18 AAC 75.
- Perform a data gap investigation and recommend a future course of action for Remedial Area 1B.

A recommendation for follow-up action that does not affect protectiveness of the remedy is provided below:

- Groundwater monitoring should be re-evaluated after remedial work under the 2-PTY Agreement is completed (petroleum and other contaminant removal). The well inventory should be incorporated, where appropriate, into the attenuation monitoring program for the bedrock aquifer at Birch Hill. An optimized alluvium and bedrock well array should be selected to monitor the attenuation of recalcitrant COCs so a remedy completion strategy can be defined. The MAROS sampling periodicity analysis presented in the 2015 monitoring report (FES 2016b) should continue to be used as a basis for other potential changes to the groundwater sampling program.

The following site-wide recommendation was identified that does not affect the protectiveness of the FWA remedies:

- The U.S. Army should develop a revised site-wide IC program to include LUC/IC requirements. This will be initiated in November 2016 with a planned completion date of September 2018.

5.4.9 Protectiveness Statement

The remedy at OU-3 Remedial Area 1B (BHTF) currently protects human health and the environment because:

- Further migration of contaminated groundwater has been reduced by the remedial actions and natural attenuation.
- ICs are in place to ensure that groundwater containing COCs will not be used.
- Off-post risks associated with consumption of contaminated groundwater are mitigated by attenuation of COCs in the alluvial aquifer.

However, in order for the remedy to be protective in the long-term, the following action needs to be taken to ensure protectiveness:

- Re-establish the cleanup goals for 1,2,4-TMB and 1,3,5-TMB in groundwater using either of the following methods: 1) update the RBCs by including the inhalation pathway and using information from the 2016 USEPA IRIS toxicity assessment or 2) adopt the cleanup goals established in 18 AAC 75.
- Perform a data gap investigation and recommend a future course of action for the OU-3 Remedial Area 1B (BHTF).

5.5 OU-3 Remedial Area 2 Valve Pits and ROLF

5.5.1 Background Information

Remedial Area 2 is located south of the BHTF, across the Chena River and north of Gaffney Road (Figures 1-2, 5-5, and 5-6). It contained a ROLF that was built in 1939 to extract fuel from tanker cars and distribute it to airfield refueling points, the quartermaster fuel system, and the BHTF. The distribution system included three valve pits. Valve Pit A was on the west side of the Chena River (pipeline to the BHTF), whereas Valve Pits B and C were located on the east side of the Chena River. Fuel was also stored in USTs in this area until they were removed in 1990. Remedial Area 2 covers 40 acres and was divided into the following six subareas based on geographic location and differing physical characteristics:

- Valve Pit A
- Valve Pit B
- Valve Pit C
- Central Header
- Former Building 1144
- Eight-car Header

5.5.1.1 Physical Characteristics

The ROLF area and Valve Pits A, B, and C are located in the floodplain and on the banks of the Chena River, within a meander bend immediately north of the FWA airstrip. A scrub-shrub wetland borders the northeast edge of the ROLF; no endangered or threatened species reside in the area.

Groundwater flow in a shallow alluvial aquifer is consistent with the westerly regional groundwater flow pattern. It is subject to seasonal variations due to influences from the Chena River stage. During the high-water season (spring melt off), the groundwater gradient can reverse or flatten due to bank storage from the surrounding river (i.e., the river contributes to the groundwater). During the balance of the year when river levels decline, groundwater flows into the river (base flow). Consequently, depth to groundwater in the vicinity of the ROLF varies between 10 and 20 ft bgs, depending on river stage.

5.5.1.2 Land and Resource Use

The area around Remedial Area 2 is used for recreational sport fishing, boating and hiking. Numerous private residential wells are located on the north bank of the Chena River, less than ½ mile downstream. The Golden Heart Utilities wells are located on the south side of the Chena River, approximately 3 miles west (down river) of OU-3 Remedial Area 2. The river separates the sites (Valve Pits and Rail Off-Loading Facility) from the Golden Heart Utilities wells. Four FWA drinking water supply wells are located approximately 1 mile south and Pioneer Class A drinking water wells for the Hamilton Subdivision are located approximately 1 mile west of the ROLF. Future land use is considered to be residential and recreational.

5.5.1.3 History of Contamination

The primary sources for contamination at Remedial Area 2 are associated with fuel and fuel additives from the storage, transfer, and handling activities at Valve Pit A, Valve Pit B, Valve Pit

C, the Central Header, Former Building 1144, and the Eight-Car Header at the ROLF. Recorded fuel spills and leaks indicate JP-4 fuel was released occasionally from the headers and tanks.

Subsurface petroleum compounds were first identified in soil gas probes installed at the ROLF in 1988. A 1992 investigation identified petroleum compounds and free product. An RI/FS was conducted in 1993 and determined that petroleum hydrocarbons and related VOCs were present in soil and groundwater (E&E 1994c, 1995a). Contamination was found near the infrastructure and pipeline transfer points (valve pits). Subsequent investigations located hot spots near the valve pits and along pipelines in the ROLF area.

5.5.1.4 Initial Response

No pre-ROD cleanup activities or response actions were performed at OU-3 Remedial Area 2.

5.5.1.5 Basis for Taking Action

COCs identified for Remedial Area 2 groundwater were developed on the basis of a baseline risk assessment. They are identified in Table 5-10 and represent fuel compounds and associated additives.

Table 5-10 OU-3 Remedial Area 2 COCs

Medium	COC
Groundwater	Benzene
	Toluene
	Ethylbenzene
	1,2-EDB
	1,2-DCA
	1,2,4-TMB
	1,3,5-TMB

5.5.2 Remedial Actions

The following RAOs were established in the September 2002 ROD for groundwater at OU-3:

- Restore groundwater to drinking water quality within a reasonable time frame.
- Reduce further migration of contaminated groundwater.
- Prevent use of groundwater with contaminants at levels above Safe Drinking Water Act standards.

A RAO was established for petroleum contaminated soil to prevent the migration of contaminants from soil to groundwater that would result in groundwater contamination above SDWA standards.

Cleanup goals identified in the 2002 ESD (U.S. Army 2002) for COCs in groundwater and soil at OU-3 are presented in Table 5-11.

Table 5-11 OU-3 Remedial Area 2 COC Cleanup Goals

Media	COC	Cleanup Goal (µg/L)	Basis
Groundwater	Benzene	5	1
	Toluene	1,000	1
	Ethylbenzene	700	1
	1,2-EDB	0.05	1
	1,2-DCA	5	1
	1,2,4-TMB	1,850	2,3
	1,3,5-TMB	1,850	2,3
Soil	Soils contaminated with VOCs and petroleum-related compounds	Active remediation until contaminant levels in groundwater are consistently below state and federal MCLs	

Notes:

1 Groundwater cleanup goal based on federal and state drinking water MCLs.
2 Groundwater cleanup goal based on a risk-based concentration equivalent to a non-cancer hazard quotient of 1 using residential groundwater exposure assumptions.
3 The 2002 ESD corrected the cleanup goals for 1,2,4-TMB and 1,3,5-TMB to 1.85 mg/L. The ROD listed cleanup goals for these constituents at 0.014 mg/L and 0.012 mg/L, respectively.

5.5.2.1 Remedy Selection

The selected remedy consisted of (U.S. Army 1996a):

- AS/SVE at known contaminant sources ("hot spots") and locations with groundwater impacts above the MCLs.
- ICs restricting access to and development at the site as long as hazardous substances remain.
- Groundwater monitoring to evaluate achievement of SDWA standards and natural attenuation to meet AWQS.

Based on the assumption that land use was not anticipated to change in the foreseeable future, the reasonable time frame for remediation at each source area was set at no more than 30 years, or by 2026 (U.S. Army 1996b).

5.5.2.2 Remedy Implementation

AS/SVE Systems

AS/SVE systems were installed in 1996 at six hot-spots throughout Remedial Area 2. They were designed to treat contaminated soil and groundwater within the alluvial aquifer and were expanded in 1997 and 1998 to capture additional impacts in the Central Header, Former Building 1144, and Eight-Car Header areas.

The systems were terminated individually through 2009 and fully decommissioned in 2012 and 2013. These actions were followed by performance monitoring and natural attenuation evaluations for groundwater COCs.

Mass balance analysis estimated that approximately 760,000 pounds of VOCs (weight equivalency of about 123,000 gallons of gasoline) were removed by the individual AS/SVE treatment systems, as follows:

- Valve Pit A – 23,411 pounds
- Valve Pit B – 31,432 pounds
- Valve Pit C – 10,450 pounds
- Central Header – 289,411 pounds
- Former Building 1144 – 248,840 pounds
- Eight-Car Header – 157,887 pounds

The extent of groundwater exceeding the benzene cleanup goal in Remedial Area 2 had decreased by more than 90 percent in 2012 (FES 2013f).

Groundwater Monitoring and ISCO Treatability Study

The current groundwater monitoring program is focused on the natural attenuation of CERCLA COCs and DRO and GRO constituents. In addition to sampling for COCs, the OU-3 ROD stated, *"…for the long-term groundwater monitoring program, lead in groundwater will also be sampled and compared to an MCL of 15 µg/L."* Monitoring for lead in groundwater was initiated in 2002 and terminated in 2011, upon agreement among the RPMs, since lead did not exceed the MCL in the wells monitored between 2008 and 2011 (a lone well exhibited lead exceedances but was damaged and not replaced).

In 2009 the AS/SVE system at Valve Pit A was shut down. An ISCO treatability study was conducted in 2010 to augment the natural attenuation of remaining contamination. Subsequent sampling data were input to a program optimization analysis performed with the MAROS software, which indicated few changes to the program based upon temporal and spatial analyses.

Institutional Controls

ICs for OU-3 were established in the 2002 ESD, which asserted that a facility-wide IC policy established in the OU-5 ROD, U.S. Army Alaska Institutional Controls Standard Operating Procedures (APVR-RPW [200-1]), and a February 2002 Memorandum on ICs (APVR-RPW-EV-[200-1c]) from Major General James J. Lovelace, Fort Richardson, Alaska would be used to develop, implement, and monitor site-specific IC requirements at the site (U.S. Army 2002). Since that time, FWA Garrison Policy #38 was issued (November 9, 2011), which updated and disseminated the LUC/ICs Policy for FWA.

ICs are maintained to ensure that groundwater will not be used until MCLs are attained. They include restrictions governing site access, construction, and water supply well installation, as long as hazardous substances remain on site at levels that preclude unrestricted use. Signs have been installed to inform the public of restrictions in this area.

Installation-wide ICs are annually inspected, summarized, and violations corrected in an annual IC report. The first annual report was prepared for 2012 (FES 2013h) and prior inspection results were included in the OU-specific monitoring reports.

5.5.2.3 Operation, Maintenance and Monitoring

There are no active remediation systems operating in Remedial Area 2. Maintenance activities are limited to monitoring well inspections and maintenance. During the annual groundwater sampling events, monitoring wells are inspected to ensure that they are accessible, locked, and in good condition. The results are presented in annual monitoring reports. Over the last several years, maintenance activities have included replacing well locks, adjusting well risers that were impacted by frost, and replacing monitoring wells observed in poor condition.

Currently, annual groundwater monitoring is performed using 31 wells within the Remedial Area 2 sites.

- Valve Pit A - five wells
- Valve Pit B - two wells
- Valve Pit C - one well
- Central Header - nine wells
- Building 1144 - eight wells
- Eight Car Header - six wells

Well locations are illustrated in Figure 5-5 (Valve Pits A, B, and C) and Figure 5-6 (ROLF).

In 2015, two monitoring wells and 21 groundwater sampling points were decommissioned and replaced with permanent PVC monitoring wells. The replacement monitoring well locations are shown on Figure 3-1, *2015 Replacement Well Locations*, in Attachment 10.

Groundwater samples are analyzed for ROD COCs and geochemistry parameters (dissolved iron and sulfate); non-ROD parameters include GRO and DRO. Wells near the Chena River also are analyzed for total aromatic hydrocarbons (TAH).

5.5.3 Progress Since the Last Five-Year Review

The Third Five-Year Review Report (U.S. Army 2011) provided the following protectiveness statement for OU-3:

> *"Remedies at OU3 are currently protective of human health and the environment; however, in order for the remedies to remain protective in the long-term, the Army will initiate appropriate responses in cooperation with the EPA and State of Alaska if future monitoring indicate significant changes from the current status of the contaminant plumes that would adversely affect human health and the environment. In the interim, exposure pathways that could result in unacceptable risks are being controlled and Institutional Controls are preventing exposure to, or ingestion of, contaminated groundwater."*

The following recommendations were provided in the Third Five-Year Review Report:

- Decommission non-operating AS/SVE systems at Valve Pit A, Central Header, Former Building 1144, and Eight Car Header.
- Continue to monitor groundwater at all of the ROLF source areas to evaluate natural attenuation.
- Continue to evaluate the *in-situ* injection treatability study at Valve Pit A.

- Perform post-wide IC inspection and evaluate protectiveness. Update restricted use boundaries in GIS as new information becomes available.
- Develop the parameters for an Annual Report of IC effectiveness and corrective actions taken (spring 2012 milestone date).
- Update the database of LUC/IC summary documents (October 2013 milestone date), which consist of tables that describes in greater detail the ICs, the objectives to be met by the restrictions, and any specific restrictions, controls, and mechanisms.

The status of these recommendations and actions taken to address them are discussed below.

- All AS/SVE systems in OU-3 Remedial Area 2 were decommissioned in 2012 and 2013.
- Groundwater has been monitored annually (reduced from a semi-annual program in 2012) at 31 wells.
- The results of the *in-situ* ISCO injection treatability study at Valve Pit A in 2010 are discussed in the annual groundwater monitoring reports.
- A post-wide IC inspection is performed and results have been documented in annual IC reports prepared for 2012, 2013, and 2014 (FES 2013d, 2015a, 2015f).
- Parameters for an annual report of IC effectiveness and corrective actions taken have been developed; they are used in the annual IC reports.
- Tables that describe in detail the ICs, objectives to be met by the restrictions, and any specific restrictions, controls, and mechanisms were updated and documented in annual IC reports prepared for 2012, 2013, and 2014 (FES 2013d, 2015a, 2015f).

5.5.4 Site Inspection

USACE inspected the sites on August 11, 2015 to examine the remediated areas and assess the protectiveness of the remedy. The sites were forested. Underground piping associated with former fueling infrastructure was observed in the ROLF area. FWA staff noted that contracts to remove former fuel systems did not include any subsurface piping or infrastructure. AS/SVE systems at Valve Pit A, Central Header, Former Building 1144 and Eight Car Header were decommissioned.

A bird habitat was under construction at the time of the site inspection. FWA staff noted that the construction was not intrusive. Concrete construction materials were staged within the ROLF area. All monitoring wells appeared to be in good condition. Community information signs appeared to be unchanged from the 2014 IC inspection (i.e., damaged but legible). Completed site inspection checklists are provided in Attachment 4 and site photographs are provided in Attachment 5.

FWA staff indicated that LUCs/ICs are maintained as required by the ROD.

The most recent IC review of OU-3 Remedial Area 2 presented in the draft 2014 report (FES 2015l) concluded:

- There was no evidence of unauthorized installation or use of groundwater wells.
- No soil disturbing activities were observed.
- Wells currently at the sites are easily accessible and secured.
- Site land uses and adjacent land use have not changed.

The five-year review site inspection confirmed these conclusions.

5.5.5 Data Review

Annual monitoring data from 2010 to 2015 indicates the past source control remedies were effective at reducing contaminant mass, which advanced the natural attenuation of COCs in Remedial Area 2. Details are provided below. Data is provided in Attachment 10 and well locations are shown on Figure 5-5 and Figure 5-6.

Valve Pit A

Groundwater under the Valve Pit A site diverges to the west, southwest and east due to influences from regional flow and proximate river levels. Five wells sampled in April/May 2015 including three groundwater probes replaced with PVC monitoring wells in 2015 (AP-10294MW, AP-10295MW, and AP-10296MW). Currently, benzene is the only COC to exceed its cleanup goal at Valve Pit A. The other COCs are below their cleanup goals. Benzene concentrations were decreasing at Valve Pit A since the 2010 ISCO treatability study until a spike in 2014 when benzene concentrations exceeded the cleanup goal in all five monitoring wells. The higher benzene concentrations were attributed to record rainfalls in June and July 2014, which elevated the water table approximately 4 ft. This recharge pulse and nearby river influences likely mobilized residual benzene from the soil and the capillary fringe, which caused elevated groundwater concentrations (such residual COC impacts in soil are described in the RI report).

The benzene concentrations generally decreased in 2015 when compared to the 2014 data except for monitoring well AP-6064, which showed an increase in concentration from 9 μg/L in 2014 to 36 μg/L in 2015. Only one other well exceeded the cleanup goal in 2015, AP-10296MW (former VPA-MP1), with a benzene concentration of 7.2 μg/L (down from 140 μg/L detected in 2014). A trend chart of benzene concentrations in select Valve Pit A wells is included as Graph 3-1 in Attachment 10.

Groundwater geochemistry data for 2015 indicates highly reduced conditions in contaminated areas, while non-impacted areas exhibit less reduced conditions (lower ferrous iron and higher sulfate concentrations). The ISCO treatability study injections in 2010 indicated that reoxygenation of the groundwater below Valve Pit A would promote additional benzene depletion, although the legacy plume shows continued degradation (refer to Attachment 10, Figure 3-3).

Valve Pit B

Three Valve Pit B wells were sampled in April/May 2015 including two groundwater probes (VPB-MP1 and VPB-MP3) that were decommissioned and replaced with PVC monitoring wells in 2015. The 2015 analytical data continue to verify that all COCs have achieved the cleanup goals since April 2001.

Valve Pit C

Well VPC-MP2 is currently monitored annually in the Valve Pit C area; a second well, VPC-MP6, was damaged before 2011 and could not be sampled. It was decommissioned in October 2011. The 2015 analytical data for well VPC-MP2 found no COCs exceeding their cleanup goals. COCs have not exceeded the cleanup goals in former well VPC-MP6 or well VPC-MP2 since 2005 and 2000, respectively.

Central Header

Nine Central Header monitoring wells are sampled annually. Five groundwater probes (AP-10274MW, AP-10275MW, AP-10276MW, AP-10277MW, and AP-10279MW) were decommissioned and were replaced with PVC monitoring wells in 2015. One COC exceeded the cleanup goals at one monitoring location, AP-10274MW (former CH-MP6), in 2015. The benzene concentration was 7.3 µg/L. Monitoring well AP-10274MW was installed in 2007 to monitor the effectiveness of the Central Header Hot Spot treatment area. The initial benzene concentration in 2007 was 20 µg/L and was below the cleanup goal for ten sampling events until 2015.

Groundwater geochemistry in the Central Header area varies significantly with pockets of moderately reduced groundwater in areas of impacts. Sulfate and dissolved iron reductions occur within different areas of the site. The sulfate and dissolved iron concentrations are included on Table 5-16, *Groundwater Sample Field Screening and Analytical Results,* in Attachment 10.

Former Building 1144

Ten wells are sampled annually at the Former Building 1144 including two monitoring wells (AP-10027 and AP-10032) and seven groundwater probes (AP-10278MW, AP-10280MW, AP-10282MW, AP-10283MW, AP-10285MW, AP-10286MW, and AP-10287MW) that were replaced in 2015. All COC concentrations in groundwater were below the cleanup goals at all ten wells sampled in 2015.

Eight Car Header

Six wells are currently monitored at the Eight Car Header site and upgradient area. All have shown COC concentrations below the cleanup goals for over five years.

Natural Attenuation Analysis

The compliment of sample datasets were evaluated in the 2015 sampling report developed by FES (FES 2016b). The report contains constituent summary tables, graphical trends, maps, and a geostatistical analysis that indicate COC reductions (mass depletion) are occurring in the alluvial aquifer. The attenuation is not uniform throughout the OU-3 sub areas due to the different source strengths, hydrostratigraphic units, permafrost, and geochemistry. The 2015 evaluation also employed Mann-Kendall trend analyses that was cross-checked by this five-year review without discrepancy.

COCs that have attenuated to meet the cleanup goals throughout OU-3 Remedial Area 2 include toluene, 1,2-EDB, 1,2-DCA, 1,2,4-TMB, and 1,3,5-TMB.

Benzene plumes within the alluvial aquifer have reduced from about 36 acres in 1996 to less than 1,000 square ft (0.2 acre) in 2015, with only the former hot spot treatment area of the Central Header being recalcitrant (refer to Attachment 10, Figure 3-4, *Benzene Plume Reduction at the Railcar Offloading Facility*). All other COCs in the ROLF subareas have reached the cleanup goals, although minor seasonal variability is apparent in the data.

Mann-Kendall statistical trend analysis and spatial plume analysis of the benzene data was completed for four of the six alluvial aquifer wells based on exceedances of the benzene cleanup level since treatment system shutdown. The analysis identified the following:

- Increasing Trend: 2 wells
- No Trend: 1 well (reflects highly variable data)
- Stable Trend: 0 wells (not increasing nor decreasing)
- Decreasing Trend: 1 well
- Non-detectable Conditions: 0 wells
- Spatial Moment Analysis: Not enough wells to definitively describe

The benzene plumes in the ROLF areas continue to exhibit mass depletion and natural attenuation that is reflected in area-wide concentration reductions.

5.5.6 Technical Assessment

5.5.6.1 Question A

Is the Remedy Functioning as Intended by the Decision Document?

Yes, the remedy is functioning as intended by the ROD and ESD.

The AS/SVE remedy at Remedial Area 2 was implemented in 1996 across six areas and expanded in 1997 and 1998. The systems were terminated from 2009-2012. The estimated timeframe to reach the cleanup goal at OU-3 is no more than 30 years. This period has not lapsed (2026). The AS/SVE systems have been effective in removing COCs from the subsurface and substantially reducing groundwater contaminant source areas. Toluene, 1,2-EDB, 1,2-DCA, 1,2,4-TMB, and 1,3,5-TMB have attenuated to below the cleanup goals. In 2015, benzene cleanup goal exceedances were identified at two wells within Valve Pit A (AP-10296 [VPA-MP1] and AP-6064) and one well within the central header (AP-10274 [CH-MP6]). The 2015 exceedance of the benzene cleanup goal at AP-10274 is the first exceedance at this location for at least the last five years. No COC exceedances were identified at Valve Pit B, Valve Pit C, the Eight Car Header, and at Former Building 1144 in samples collected in 2015. The 2015 draft monitoring report included Mann-Kendall trend analyses for benzene. Increasing trends were identified at the following locations:

- AP-10274 (Central Header)

  The 2015 benzene concentration is the highest concentration detected at AP-10274 over the last five years and the only exceedance of the benzene cleanup goal at AP-10274. Further monitoring is required to assess why the concentration increased from 1.7 µg/L in 2014 to 7.3 µg/L in 2015. Based on the available information, the increasing benzene trend at this location is not expected to affect remedy protectiveness.

- AP-10283 (Former Building 1144)

  Although an increasing trend was identified at this location, the short term benzene concentrations have remained fairly consistent fluctuating from 3.5 J µg/L to 5.1 µg/L over the last five years. The 2015 sampling results were just below the cleanup goal at a concentration of 4.3 µg/L. Based on this information, the increasing benzene trend at this well is not expected to affect remedy protectiveness.

LUC/ICs have been implemented and are functioning as intended.

The following areas of potential optimization for the Remedial Area 2 remedy were identified:

- The historical decommissioning of infrastructure may have resulted in the abandonment of pipeline with impacts at Remedial Area 2. The U.S. Army will conduct an investigation and determine if there are any previously undiscovered source areas at Remedial Area 2.
- An ISCO treatability study was conducted at Valve Pit A. The U.S. Army will continue to evaluate whether ISCO injections of excavation of contaminated soil at Valve Pit A would enhance natural attenuation in groundwater.

The MAROS sampling periodicity analysis should be used as a basis for any potential programmatic changes.

One early indicator of potential problems was identified at the OU-3 Valve Pit A: increasing concentrations of benzene were identified.

5.5.6.2 Question B

Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Still Valid?

No, not all of the exposure assumptions, toxicity data, cleanup levels, and RAOs established at the time of the remedy remain valid. A review of the exposure assessment and toxicity criteria changes is provided in Attachment 8. The major exposure assumptions for current and future potential land uses have not changed. Although potential vapor intrusion risks were not evaluated to off-site residents at the time of the remedy, groundwater concentrations at OU-3 Remedial Area 2 remain below very conservative vapor intrusion levels and vapor intrusion is not a concern at OU-3.

As explained in Attachment 8, the toxicity criteria used to develop risk-based concentrations for 1,2,4-TMB and 1,3,5-TMB have been updated since the cleanup goals were identified in the 1996 ROD and then changed in the 2002 ESD. These toxicity changes do not indicate that the TMBs are more toxic now than previously assumed, so the toxicity changes do not affect the protectiveness of the remedy. However, TMBs were eliminated from the inhalation pathway during the development of TMB cleanup goals, which was an error. The 1994 baseline risk assessment clearly considered residential inhalation of VOCs from tap water to be a complete exposure pathway, which was quantified in characterizing the baseline risk from exposure to site contaminants. Therefore, the change in risk-based cleanup goals for TMBs in the ESD was not justified; they should not have been increased by over a factor of 100. As LUCs are in place to prevent ingestion of groundwater, the remedy remains protective in the short term, but if the water to be used as a source of tap water for residents, the cleanup goals may not be fully protective.

5.5.6.3 Question C

Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

5.5.6.4 Technical Assessment Summary

The AS/SVE remedy was implemented in 1996 (six areas) and expanded in 1997 and 1998. The systems were terminated during 2009 to 2012. In 2015, benzene was the only COC detected above cleanup goals in the Valve Pit A and Central Header areas. Toluene, ethylbenzene, 1,2-EDB, 1,2-DCA, 1,2,4-TMB, and 1,3,5-TMB have attenuated to the cleanup goals. ICs were implemented and are maintained to prevent adverse exposures of receptors to groundwater impacts. No changes to ARARs were identified that would affect the protectiveness of the remedy. One issue was identified that is attributed to the development of the TMB cleanup goal in the ESD. This issue is summarized below with a corresponding recommendation for follow-up action.

5.5.7 Issues

The following issues were identified that may affect future protectiveness of the remedy at OU-3 Remedial Area 2:

- The inhalation pathway should not have been eliminated during development of the TMB cleanup goals in the ESD. The 1994 baseline risk assessment clearly considered residential inhalation of volatiles from tap water to be a complete exposure pathway, which was quantified in characterizing the baseline risk from exposure to site contaminants.
- The historical decommissioning of infrastructure may have resulted in the abandonment of pipeline with impacts at Remedial Area 2.

The following site-wide concern was identified that does not affect the protectiveness of the FWA remedies:

- The site-wide SOP does not include documentation and information regarding all LUCs required throughout FWA.

5.5.8 Recommendations for Follow-up Actions

The following recommendations for follow-up actions at OU-3 Remedial Area 2 are provided:

- Re-establish the cleanup goals for 1,2,4-TMB and 1,4,5-TMB in groundwater using either of the following methods:
    - Update the RBCs by including the inhalation pathway and using information from a 2016 USEPA IRIS toxicity assessment, or
    - Adopt the cleanup goals established in 18 AAC 75.
- Conduct an investigation and determine if there are any previously undiscovered source areas at Remedial Area 2.

The following recommendation is provided for a follow-up action that does not affect protectiveness of the remedy:

- Continue to evaluate whether ISCO injections or excavation of contaminated soil at Valve Pit A would enhance natural attenuation in groundwater.

The following site-wide recommendation was identified that does not affect the protectiveness of the FWA remedies:

- The U.S. Army should develop a revised site-wide IC program to include LUC/IC requirements. This will be initiated in November 2016 with a planned completion date of September 2018.

5.5.9 Protectiveness Statement

The remedy at OU-3 Remedial Area 2 (Valve Pits and ROLF) currently protects human health and the environment because:

- Further migration of contaminated groundwater has been reduced by the remedial actions and natural attenuation.
- ICs are in place to ensure that groundwater containing COCs will not be used.

However, in order for the remedy to be protective in the long-term, the following action needs to be taken to ensure protectiveness:

- Re-establish the cleanup goals for 1,2,4-TMB and 1,3,5-TMB in groundwater using either of the following methods: 1) update the RBCs by including the inhalation pathway and using information from the 2016 USEPA IRIS toxicity assessment or 2) adopt the cleanup goals established in 18 AAC 75.
- Conduct an investigation and determine if there are any previously undiscovered source areas at Remedial Area 2.

5.6 OU-3 Remedial Area 3 FEP Mileposts 2.7 and 3.0

5.6.1 Background Information

Remedial Area 3 consists of two source areas along the Fairbanks-Eielson Pipeline at Milepost 2.7 and Milepost 3.0 (Figures 2-1 and 5-7). The sites are located in the East Birch Hill Tank Farm area and the milepost designations indicate distances along the Fairbanks-Eielson Pipeline from the BHTF (e.g., Milepost 2.7 is located approximately 2.7 miles east of the BHTF).

A third area, Milepost 15.75, was located in an off-post residential setting. It was granted NFA status on January 30, 2012 and is not discussed further. Monitoring wells at the Milepost 15.75 site have been decommissioned (FES 2013f).

5.6.1.1 Physical Characteristics

Milepost 2.7 and Milepost 3.0 source areas both have a moderate to steep south-facing slopes to the north and a shallow, south-facing slope to the south. The shallow alluvial aquifer in this area is covered with poorly drained sediments and ponded surface water is common from spring until mid-summer. Discontinuous permafrost is typical in the subsurface soil. A black spruce-scrub-shrub wetland borders the south side of the source areas, while the surrounding area is densely vegetated. Groundwater is encountered at depths between 3 and 12 ft bgs and flows to the southwest.

5.6.1.2 Land and Resource Use

The Milepost 2.7 and 3.0 sites are located within a military training area north of the Chena River approximately 1 mile from the nearest residential development. Both areas are used recreationally. The Birch Hill Ski area is 1 mile to the east and has a drinking-water well completed in bedrock. It is not hydraulically connected to the alluvial aquifer under these sites.

5.6.1.3 History of Contamination

Historic (1989) soil gas analyses along the Fairbanks-Eielson Pipeline identified elevated levels of benzene, toluene, ethylbenzene, and xylenes (BTEX) in the milepost areas. Subsequent investigations detected petroleum hydrocarbons (gasoline products and additives) contamination in surface and subsurface soils and groundwater (specifically benzene). These impacts are postulated as pipe leakage and spills.

5.6.1.4 Initial Response

No pre-ROD cleanup activities or response actions were performed at OU-3 Remedial Area 3.

5.6.1.5 Basis for Taking Action

COCs identified for OU-3 Remedial Area 3 groundwater were developed on the basis of a baseline risk assessment. They are identified in Table 5-12 and represent fuel compounds and associated additives.

Table 5-12 OU-3 Remedial Area 3 COCs

Medium	COC
Groundwater	Benzene
	Toluene
	Ethylbenzene
	1,2-EDB
	1,2-DCA
	1,2,4-TMB
	1,3,5-TMB

5.6.2 Remedial Actions

5.6.2.1 Remedy Selection

The following RAOs were established for groundwater in OU-3 groundwater in the January 1996 ROD:

- Restore groundwater to drinking water quality within a reasonable time frame.
- Reduce further migration of contaminated groundwater.
- Prevent use of groundwater with contaminants at levels above SDWA standards.

A RAO was also established in the ROD for petroleum contaminated soil; to prevent migration of contaminants from soil into groundwater that would result in groundwater contamination and exceedance of SDWA standards.

Cleanup goals identified in the 1996 ROD and 2002 ESD for COCs in groundwater are presented in Table 5-13.

Table 5-13 OU-3 Remedial Area 3 COC Cleanup Goals

Media	COC	Cleanup Goal (µg/L)	Basis
Groundwater	Benzene	5	1
	Toluene	1,000	1
	Ethylbenzene	700	1
	1,2-EDB	0.05	1
	1,2-DCA	5	1
	1,2,4-TMB	1,850	2,3
	1,3,5-TMB	1,850	2,3
Soil	Soils contaminated with VOCs and petroleum-related compounds	Active remediation until contaminant levels in groundwater are consistently below state and federal MCLs	

Notes:

1 Groundwater cleanup goal based on federal and state drinking water MCLs.
2 Groundwater cleanup goal based on a risk-based concentration equivalent to a non-cancer hazard quotient of 1 using residential groundwater exposure assumptions.

3 The 2002 ESD corrected the cleanup goals for 1,2,4-TMB and 1,3,5-TMB to 1.85 mg/L. The ROD listed cleanup goals for these constituents at 0.014 mg/L and 0.012 mg/L, respectively.

The selected remedy consisted of (U.S. Army 1996b):

- SVE of petroleum contaminated soils and AS of petroleum contaminated groundwater in permafrost free areas at Milepost 2.7 and 3.0, and known source areas where MCLs were exceeded at Milepost 15.75 to achieve SDWA levels and natural attenuation to meet AWQS[3].
- ICs that restrict access to and development at the site as long as hazardous substances remain.
- Groundwater monitoring

5.6.2.2 Remedy Implementation

Air Sparge Treatability Study, Excavation and Ex-situ Treatment of Soil, and Injection of Oxygen-Releasing Compounds into Groundwater

An AS treatability study was conducted at Milepost 2.7 in 1996. A study involving ORCs injected into the groundwater was also evaluated that same year. These *in-situ* technologies were not considered viable for the site due to low soil permeability. A treatability study was performed during 1998 to evaluate the feasibility of excavation and *ex-situ* soil treatment. This involved the excavation of approximately 1,500 CY of contaminated soil that were placed in a treatment cell constructed adjacent to the Truck Fill Stand. The AS/SVE blowers were utilized to treat the petroleum contaminated soil *ex-situ* and soil contaminant concentrations decreased significantly. In 2003, the Milepost 2.7 soil treatment cell was decommissioned.

A pilot study was conducted at Milepost 3.0 in 1996 involving the use of ORC injected as a slurry below the water table. As with Milepost 2.7, analytical results of groundwater samples indicated that injection of the ORC slurry was ineffective. Despite the positive results of the Milepost 2.7 treatability study for excavation and *ex-situ* treatment of soils, it was not clear if the same technology would be effective for Milepost 3.0 due to potential differences in soil or contaminant concentrations between the two sites. Therefore, in April 2000, a pilot-study excavation and subsequent *ex-situ* soil treatment was performed. This involved the excavation of approximately 6,000 CY of petroleum contaminated soil that was mixed with gravel and placed in an 8,000 CY treatment cell constructed at the base of Birch Hill. The Building 1173 AS/SVE blowers were utilized to treat the contaminated soil *ex-situ*. This treatment cell operated for two field seasons, with the main contaminants being GRO and benzene. Contaminant concentrations in the treatment cell decreased rapidly and the cell was decommissioned in 2003.

Through implementation of the ROD remedial actions and additional historical research, a better understanding of the sources and volumes of contamination, groundwater movements, and geology led to a re-evaluation of the remedial actions. It concluded that the remedies selected in the ROD for Milepost 2.7 and Milepost 3.0 would not fully achieve the RAOs without significant changes to the remedial method.

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[3] Milepost 15.75 was granted NFA status on January 30, 2012.

The 2002 ESD documented the recommended changes in remedial strategy. Based on additional sampling conducted post-ROD, it was found that the soils in both locations contained high fractions of tight silt and clay, thus limiting the movement of air within the vadose zone, which is necessary for effective contaminant reduction. Therefore, the selected remedial action in the selected in the ROD for this area, AS/SVE *in-situ* treatment, could not be effectively implemented. However, pilot studies conducted after the ROD showed that *ex-situ* treatment of soil would be effective in meeting soil cleanup goals.

The following actions that were not anticipated at the time of the ROD were implemented in accordance with the 2002 ESD for Remedial Area 3 (i.e., some actions like excavation and *ex-situ* treatment of soil were completed prior to development of the ESD):

- Excavation of contaminated soils from Milepost 2.7 (1,500 CY) and Milepost 3.0 (6,000 CY) for *ex-situ* AS/SVE.
- Treatment of the excavated soil in *ex situ* cells to achieve soil disposal criteria.
- Monitoring of soil and groundwater contamination remaining in the vicinity of Remedial Area 3 until RAOs have been achieved, as determined by concurrence of the RPMs.
- Installation of additional monitoring wells and site characterization at Mileposts 2.7 and 3.0 to gain a better understanding of local hydrology, impacts of permafrost, and contaminant migration.

A limited soil excavation and bioaugmentation treatability study was conducted during regrading of a road in 2009. At Milepost 2.7, an ORC and microorganism solution was added to a trench perpendicular to the road. At the Milepost 3.0 site, ORC alone, microorganisms alone, and ORC and microorganisms were added to three trenches perpendicular to the road to treat groundwater migrating along the road. The excavated soils from the trenches were treated in an *ex-situ* treatment cell using ORC and microorganisms.

Institutional Controls

ICs for OU-3 were established in the 2002 ESD, which asserted that a facility-wide IC policy established in the OU-5 ROD, U.S. Army Alaska Institutional Controls Standard Operating Procedures (APVR-RPW [200-1]), and a February 2002 Memorandum on ICs (APVR-RPW-EV-[200-1c]) from Major General James J. Lovelace, Fort Richardson, Alaska would be used to develop, implement, and monitor site-specific IC requirements at the site (U.S. Army 2002). Since that time, FWA Garrison Policy #38 was issued (November 9, 2011), which updated and disseminated the LUC/ICs Policy for FWA.

ICs are maintained to ensure that groundwater will not be used until MCLs are attained. They include restrictions governing site access, construction, and water supply well installation as long as hazardous substances remain on site at levels that preclude unrestricted use.

ICs at each OU are inspected annually and a complete summary of the survey and corrective actions taken are presented in an annual IC report. The first annual report was prepared for 2012 (FES 2013h) and prior IC inspections were included in the OU-specific annual monitoring reports. IC inspections evaluate potential land use changes, site security (monitoring wells, etc., as applicable), or unauthorized groundwater use. In addition, reviews of the FWA IC GIS layer and the site-specific information in the ADEC contaminated sites database are conducted.

<u>Groundwater Monitoring</u>

Groundwater monitoring at the Milepost 2.7 and 3.0 source areas for natural attenuation is currently ongoing for ROD COCs, GRO, and geochemistry parameters.

5.6.2.3 <u>Operation, Maintenance and Monitoring</u>

There are no active remediation systems operating in Remedial Area 3. Maintenance activities are limited to monitoring well inspections. During the groundwater sampling events and IC survey, monitoring wells are inspected to ensure that they are accessible, locked, and in good condition. The results of the inspections are presented in annual IC reports. Over the last several years, maintenance activities have included replacing well locks and adjusting well risers that were impacted by frost.

Following the 2011 sampling event, the sampling frequency at Milepost 2.7 and Milepost 3.0 was reduced from annually to once every five years and was scheduled to coincide with the five-year reviews. Two rounds of groundwater data (2011 and 2015) have been collected since the last five-year review. Samples were collected from 22 wells in 2011 and 20 wells in 2015. Well locations are illustrated in Figure 5-7. Groundwater samples from both events were analyzed for ROD COCs, GRO, and geochemistry parameters (e.g., iron and sulfate).

5.6.3 Progress Since the Last Five-Year Review

The Third Five-Year Review Report (U.S. Army 2011) provided the following protectiveness statement for OU-3:

> *"Remedies at OU3 are currently protective of human health and the environment; however, in order for the remedies to remain protective in the long-term, the Army will initiate appropriate responses in cooperation with the EPA and State of Alaska if future monitoring indicate significant changes from the current status of the contaminant plumes that would adversely affect human health and the environment. In the interim, exposure pathways that could result in unacceptable risks are being controlled and Institutional Controls are preventing exposure to, or ingestion of, contaminated groundwater."*

The Third Five-Year Review provided the following recommendations:

- The current site model indicates that contamination does not appear to be migrating off site and continued groundwater monitoring should be sufficient to ensure protectiveness. After the 2011 sampling event, groundwater monitoring at both the Milepost 2.7 and Milepost 3.0 sites should be conducted every five years.
- Perform post-wide IC inspections and evaluate protectiveness. Update restricted use boundaries in GIS as new information becomes available.
- Develop the parameters for an Annual Report of IC effectiveness and corrective actions taken (spring 2012 milestone date).
- Update the database of LUC/IC summary documents (October 2013 milestone date), which consist of tables that describe in greater detail the ICs, the objectives to be met by the restrictions, and any specific restrictions, controls, and mechanisms.

The status of these recommendations and actions taken are discussed below.

- Following the 2011 sampling event, groundwater monitoring frequency at the Milepost 2.7 and Milepost 3.0 sites was reduced to every five years to coincide with the five-year review recommendation.
- A post-wide IC inspection is performed and results are documented in annual IC reports prepared for 2012, 2013, and 2014 (FES 2013h, 2015a, 2015f).
- Parameters for an annual report of IC effectiveness and corrective actions taken have been developed; they are used in the annual IC reports.
- Tables that describe in detail the ICs, objectives to be met by the restrictions, and any specific restrictions, controls, and mechanisms were updated and documented in annual IC reports prepared for 2012, 2013, and 2014 (FES 2013d, 2015a, 2015f).

5.6.4 Site Inspection

The Milepost 2.7 and Milepost 3.0 sites were inspected by USACE on August 11, 2015 to examine the remediated areas and assess the protectiveness of the remedies. The areas were relatively remote and forested. The areas were used for improvised explosive device discovery and disarming training. Frost heaving was observed in several monitoring wells. FWA staff indicated that the well construction (long screened intervals) allowed the wells to continue to be sampled despite the frost heaving. An information sign was in good condition. Completed site inspection checklists are provided in Attachment 4 and site photographs are provided in Attachment 5.

FWA staff indicated that LUCs/ICs are maintained as required by the ROD. The most recent IC review of OU-3 Remedial Area 3 is documented in the draft 2014 IC report (FES 2015f), which concluded:

- There was no evidence of unauthorized installation or use of groundwater wells.
- No soil disturbing activities were observed.
- Wells currently at the sites are easily accessible and secured.
- Site land uses and adjacent land use have not changed.

The five-year review site inspection confirmed these conclusions.

5.6.5 Data Review

Groundwater analytical data from 2011 and 2015 are similar to historical data and indicate that past source control remedies were somewhat effective at reducing contaminant mass. Generally, benzene, toluene, 1,2-EDB, and 1,2-DCA continue to exceed the cleanup goals, although some wells are exhibiting decreasing trends. Elevated GRO concentrations were detected at OU-3 Remedial Area 3; however, GRO was not selected as a COC in the ROD. A linear regression analysis presented in the 2011 OU-3 Monitoring Report estimated the timeframes to reach the benzene cleanup goal in those wells with decreasing trends. The results ranged from three to 46 years at Milepost 2.7 and 32 years at Milepost 3.0. Several wells are exhibiting increasing benzene trends over time. The latest (2015) groundwater analytical data are provided in Attachment 10. Monitoring well locations are shown on Figure 5-7.

Due to damage caused by frost heaving, three new wells were installed in each milepost site. AP-6034, AP-8707, and AP-9084 were replaced by AP-10300MW, AP-10302MW, and AP-

10301MW at Milepost 2.7. AP-5850, AP-6039, and AP-8712 were replaced by AP-10298MW, AP-10297MW, and AP-10299MW at Milepost 3.0.

Due to the increasing extent and magnitude of groundwater contamination at the two milepost source areas, a data gap analysis is planned (Marsh Creek 2015b). The purpose of the data gap analysis is to determine the source of the groundwater contamination and to recommend future actions. The scheduled data-gap analysis will provide additional source characterization to establish the extent of contamination and identify potential transport pathways. It will support the assessment of exposure risks and selection of any associated remedial measures. Additional soil and groundwater sampling will be performed in the area of the former underground storage tanks at the BHTF, as well as at points along the Fairbanks-Eielson Pipeline.

5.6.6 Technical Assessment

5.6.6.1 Question A

Is the Remedy Functioning as Intended by the Decision Document?

No, the remedy is not functioning as intended by the ROD.

Active remedial measures (AS treatability study, ORC injection, and excavation with *ex situ* treatment) have not met the RAOs (restore groundwater to drinking water quality within a reasonable timeframe and reduce further migration of contaminated groundwater). The ROD-estimated time frames to achieve the cleanup goals were estimated at 46 years (Milepost 2.7) and 32 years (Milepost 3.0). The estimated time frames were updated in the 2011 groundwater monitoring report using linear regression on a contaminant-by-contaminant basis to three to 46 years. The benzene and EDB concentrations remain above cleanup goals and show increasing trends in at least one well. Analysis has shown that groundwater cleanup goals will not be achieved within a reasonable period of time. To better understand site conditions, a data gap analysis will be performed. Following the collection of additional soil and groundwater data, a future course of action will be recommended.

LUC/ICs have been implemented and are functioning as intended. Opportunities for optimization have not been identified. Consistent with the information provided above, the data reviewed for Remedial Area 3 suggest future problems with the selected remedy. No other early indicators of potential problems were identified.

5.6.6.2 Question B

Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Still Valid?

No, not all of the exposure assumptions, toxicity data, cleanup levels, and RAOs established at the time of the remedy remain valid. The major exposure assumptions for current and future potential land use have not changed. Although potential vapor intrusion risks were not evaluated to off-site residents at the time of the remedy, groundwater concentrations at OU-3 remain below very conservative vapor intrusion levels and vapor intrusion is not a concern.

As explained in Attachment 8, the toxicity criteria used to develop RBCs for 1,2,4-TMB and 1,3,5-TMB have been updated since the cleanup goals were identified in the 1996 ROD and then changed in the 2002 ESD. These toxicity changes do not indicate that the TMBs are more toxic now than previously assumed, so the toxicity changes do not affect the protectiveness of the remedy. However, TMBs were eliminated from the inhalation pathway during the development of the TMB Cleanup goals, which was an error. The 1994 baseline risk assessment clearly considered residential inhalation of volatiles from tap water to be a complete exposure pathway, which was quantified in characterizing the baseline risk from exposure to site contaminants. Therefore, the change in risk-based cleanup goals for TMBs in the ESD was not justified; they should not have been increased by over a factor of 100. As LUCs are in place to prevent ingestion of groundwater, the remedy remains protective in the short term, but if the water to be used as a source of tap water for residents, the cleanup goals may not be fully protective.

5.6.6.3 Question C

Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

5.6.6.4 Technical Assessment Summary

The AS/SVE remedy was not fully implemented due to low soil permeabilities at the FEP Milepost 2.7 and 3.0 sites. Benzene, toluene, 1,2-EDB, and 1,2-DCA exceeded the cleanup goals. The estimated timeframes to reach the cleanup goals were revisited in a 2011 monitoring report. The results ranged from 46 years at Milepost 2.7 and 32 years at Milepost 3.0. A data gap analysis will be performed at these sites to determine the source of groundwater contamination and to recommend future actions. Increasing concentrations of COCs were identified in groundwater monitoring at Remedial Area 3; however, components of the remedy have been implemented to prevent adverse exposures. Specifically, ICs have been implemented and are maintained to ensure that no risk is posed to receptors due to exposures to impacted groundwater. No changes to ARARs were identified that would affect the protectiveness of the remedy. One issue was identified in the development of the TMB cleanup goal in the ESD. This issue is summarized below with a corresponding recommendation for follow-up action.

5.6.7 Issues

The following issues were identified the OU-3 Remedial Area 3 (FEP Mileposts 2.7 and 3.0) that affect protectiveness of the remedy:

- The concentrations of benzene remain high and exhibit increasing trends in several wells. Analysis has shown that groundwater cleanup goals will not be achieved for these areas within a reasonable period of time.
- The inhalation pathway should not have been eliminated during development of cleanup goals for TMBs in the ESD. The 1994 baseline risk assessment clearly considered residential inhalation of volatiles from tap water to be a complete exposure pathway which was quantified in characterizing the baseline risk from exposure to site contaminants.

The following site-wide concern was identified that does not affect the protectiveness of the FWA remedies:

- The site-wide SOP does not include documentation and information regarding all LUCs required throughout FWA.

5.6.8 Recommendations for Follow-up Actions

The following recommendations are provided for follow-up action at OU-3 Remedial Area 3 that affect protectiveness of the remedy.

- Perform a data gap investigation and recommend a future course of action for the milepost sites. (This activity is currently under contract with the U.S. Army).
- Re-establish the cleanup goals for 1,2,4-TMB and 1,4,5-TMB in groundwater using either of the following methods:
  - Update the RBCs by including the inhalation pathway and using information from a 2016 USEPA IRIS toxicity assessment, or
  - Adopt the cleanup goals established in 18 AAC 75.

The following site-wide recommendation was identified that does not affect the protectiveness of the FWA remedies:

- The U.S. Army should develop a revised site-wide IC program to include LUC/IC requirements. This will be initiated in November 2016 with a planned completion date of September 2018.

5.6.9 Protectiveness Statement

The remedy at OU-3 Remedial Area 3 (FEP Mileposts 2.7 and 3.0) currently protects human health and the environment because:

- Permafrost and low permeability soils inhibit groundwater flow and the migration of contaminants from the sites.
- There are no complete pathways for human exposure to groundwater. ICs are in-place to ensure that contaminated groundwater will not be used until cleanup goals are attained.

However, in order for the remedy to be protective in the long-term, the following actions need to be taken to ensure protectiveness:

- Perform a data gap investigation and recommend a future course of action at the milepost sites (This activity is currently under contract with the U.S. Army).
- Re-establish the cleanup goals for 1,2,4-TMB and 1,3,5-TMB in groundwater using either of the following methods: 1) update the RBCs by including the inhalation pathway and using information from a 2016 USEPA IRIS toxicity assessment, or 2) adopt the cleanup goals established in 18 AAC 75.

5.7 OU-4 Landfill

OU-4 consisted of three source areas: a Landfill (containing active and inactive portions), a Coal Storage Yard, and Fire Training Pits.

A Landfill Caterpillar shed (Building 1191), located south of the active landfill, was investigated in 2010 to assess the potential for groundwater contamination at this area (FES 2011a). The shed was added to OU-4 as part of a Consent Order Agreement and Final Order (USEPA Region 10 and U.S. Army Garrison, Fort Wainwright Alaska 2011). Three monitoring wells were installed that are currently being sampled as part of the long term monitoring of the OU-4 Landfill.

Locations of the OU-4 Landfill and Coal Storage Yard are illustrated on Figure 2-1.

5.7.1 Background Information

5.7.1.1 Physical Characteristics

The OU-4 Landfill (Landfill Source Area) occupies approximately 14 acres north of River Road. It is immediately adjacent to FWA's active landfill (Figure 5-8). The Landfill Source Area is an inactive portion of the landfill that was addressed in the ROD for OU-4 (U.S. Army 1996b).

The entire FWA Landfill (i.e. active and inactive areas) encompasses approximately 60 acres; approximately 40 acres are north of River Road and a 20 acre area, known as the former trench area, is south of River Road. The FWA Landfill is bordered by wetlands to the north and east and by black spruce forest elsewhere except for areas that have been cleared for access to the landfill (U.S. Army 2011).

FWA is underlain by soil and sediment that consists of silt, sand, and gravel that ranges from 10 ft to 400 ft thick. At the landfill, soil types are coarser grained. Discontinuous permafrost occurs at depths of 3 ft to more than 50 ft and is more prevalent north of the Chena River (U.S. Army 1996b).

The landfill is located within a 500 year floodplain. It is surrounded by discontinuous permafrost that is part of a complex hydrogeologic regime. The landfill is believed to be situated in a permafrost-free zone. Where permafrost is present, the aquifer may exhibit shallow (suprapermafrost) and deep (subpermafrost) water-bearing zones. Where permafrost is absent, a single unconfined aquifer is present (U.S. Army 1996b). Three groundwater zones are monitored at the site; a shallow zone, an intermediate zone, and a deep zone. Potentiometric surface measurements indicate that groundwater in all three zones generally flows to the west/southwest at low hydraulic gradient. The flow directions are subject to seasonal variations and may be interrupted or redirected by permafrost in some locations (U.S. Army 2011). Depth to groundwater in the vicinity of the landfill is approximately 15 to 20 ft bgs. Groundwater flow velocities were estimated to range from 100 to 5,600 ft per year in the shallow zone and from 1,000 to 1,400 ft per year in the deep zone (U.S. Army 1996b).

No endangered or threatened species reside in the landfill area (U.S. Army 2011).

5.7.1.2 Land and Resource Use

The Landfill Source Area and the Former Trench Area are inactive. The active landfill is used for disposal of construction and demolition debris. It currently operates under an ADEC solid waste permit as an unlined Class 1 Solid Waste Facility. It is permitted through 2020 (FES

2015h). Current and future land use is light industrial. Groundwater use is considered residential because water supply wells for the City of Fairbanks are located in the same aquifer.

5.7.1.3 History of Contamination

Landfilling activities began in the early 1950s. The Landfill Source Area was permitted to accept domestic and commercial refuse, ash, asbestos, incinerator residue, and construction and demolition waste. Wastes were initially dumped into gravel pits, burned and covered. In the early 1960s, trenching and burning ceased and the waste was spread by bulldozer and covered with coal ash from a power plant on FWA.

Materials that may have been disposed in the Landfill Source Area include human wastes, household refuse, POLs, hazardous waste, solvents, pesticides, asbestos, construction debris, and inert munitions (U.S. Army 2011). Investigations have identified other suspected wastes that may have been disposed, which include: dry cleaning waste and filters (reportedly distilled to remove PCE), vehicle paint, asbestos, small arms and explosives, triple-rinsed, punctured, and crushed pesticide cans, rags, and soil from small pesticide spills of less than one gallon, empty drums, and paint debris (U.S. Army 2011).

The Landfill Caterpillar shed (Building 1191) was previously used for vehicle storage and repair. An injection well at the shed contained a septic tank and leach pit that previously served as a bathroom and a floor drain in a vehicle storage area of the shed. The septic system was an injection well that received motor vehicle fluids.

5.7.1.4 Initial Response

An area petroleum hydrocarbon and lead contaminated surface soil in the inactive portion of the landfill was covered with approximately 8 ft of construction debris and native soils prior to the OU-4 ROD (U.S. Army 2011). This was done to eliminate the potential for dermal exposure to lead.

5.7.1.5 Basis for Taking Action

The primary sources of contamination at the Landfill Source Area are wastes that were placed in the landfill and coal ash from the power plant. Investigations determined that soil and groundwater were contaminated.

Soil

Petroleum hydrocarbons and lead, from a spill, were present at one surface soil location. The area was permanently covered prior to the ROD.

Groundwater

VOCs (1,1,2,2-tetrachloroethane [PCA], 1,1,2-TCA, TCE, cis-1,2 DCE, vinyl chloride, and benzene) and a semi-volatile organic compound (SVOC) (bis(2-ethylhexyl)phthalate) were detected in groundwater downgradient of the landfill at concentrations that exceeded federal drinking water MCLs and USEPA Region 3 RBCs used for screening contaminants of potential concern (U.S. Army 2011). Excess lifetime cancer risks associated with the consumption of contaminated groundwater downgradient of the Landfill Source Area exceeded the acceptable risk range for 1,1,2,2-PCA and bis(2-ethylhexyl)phthalate.

5.7.2 Remedial Actions

5.7.2.1 Remedy Selection

The following RAOs were established for groundwater in the August 1996 ROD:

- Restore groundwater to its beneficial use of drinking water quality within a reasonable time frame (defined as 70 years).
- Reduce further migration of contaminated groundwater from the source area.
- Prevent use of groundwater containing contaminants at levels above federal MCLs and AWQS (18 AAC 70).
- Use natural attenuation to attain AWQS (18 AAC 70).

COCs and site cleanup goals for groundwater are identified in Table 5-14; they represent USEPA and State of Alaska MCLs.

Table 5-14 OU-4 Landfill Groundwater COCs and Cleanup Goals

COC	Cleanup Level (µg/L)	Basis
VOCs		
Benzene	5	USEPA MCL
cis-1,2-DCE	70	USEPA MCL
1,1,2,2-PCA	5.2	USEPA Region 3 RBC [1, 2]
1,1,2-TCA	5	USEPA MCL
TCE	5	USEPA MCL
Vinyl chloride	2	USEPA MCL
SVOCs		
bis(2-Ethylhexyl)phthalate	6	USEPA MCL

Notes:

1 USEPA Region 3 RBC at the 1 x 10^{-4} incremental cancer risk level.

2 This constituent now has a State of Alaska MCL (4.3 µg/L) in 18 AAC 75, Table C.

The selected remedy included a phased approach intended to restore groundwater to its beneficial use as a potential drinking water aquifer. It included the following elements:

Landfill Cap

- Cap the inactive portion of the landfill with a minimum of 2 ft of native soil to achieve a permeability no greater than 1 x 10^{-5} centimeters per second.
- Vegetate the cap with native plants.
- Promote drainage to prevent ponding and erosion.

Groundwater

- Achieve the RAO for groundwater through natural attenuation.
- Monitor groundwater downgradient of the landfill and evaluate the results to determine the effectiveness of the capping and natural attenuation.

Contingent Remedy

- Evaluate the need for a methane gas collection system during the remedial design.

- Consider an active remediation system if natural attenuation of groundwater did not progress as projected or did not result in a significant reduction in leachate.

Institutional Controls

- Maintain ICs that restrict access to and development of the site as long as hazardous substances remain on site at levels that preclude unlimited use and unrestricted exposure.

5.7.2.2 Remedy Implementation

The cap was installed in September 1997, it covered 14 acres of the closed landfill. The former trench area was not capped because contaminants were not found in soil at levels that posed an unacceptable risk to human health or the environment.

The landfill cap included the following components (from bottom to top):

- Unclassified subgrade material (6 inches thick) for the base of the cap (unclassified material is inorganic soil free if trash, peat, debris, or frozen clods that is capable of being compacted in accordance with the design plans).
- Low permeability soil layer (18 inches thick) compacted to achieve a maximum permeability of 5×10^{-5} centimeters per second or less.
- Sand drainage layer (6 inches thick).
- Woven geotextile fabric.
- Top soil layer at least 6 inches thick.
- Surface vegetation consisting of grass and wildflower mixture.

A methane gas collection system was evaluated during the remedial design and determined to be unnecessary. It was not installed.

ICs have been implemented. They include access restrictions (posted signs, fencing around the inactive portion of the landfill), deed restrictions on future land use if land is transferred out of federal ownership, restrictions on groundwater well installation, restrictions on the use of wells, and well use advisories. Significant elements of the FWA base-wide IC policy include project planning procedures, dig clearance requirements, standard operating procedures associated with LUC/ICs, and incorporation of LUC/IC details in a FWA GIS database. LUC/ICs are still in effect at the Landfill Source Area. Excavation and groundwater intrusion are restricted and may only be authorized by FWA Directorate of Public Works, Environmental Department (U.S. Army 1996b).

5.7.2.3 Maintenance and Monitoring

Maintenance and monitoring consist of the following activities:

- Semi-annual monitoring of groundwater (spring and fall)
- Annual inspection of the landfill cap

Groundwater Monitoring

Post remedial action groundwater monitoring began in December 1998. Groundwater monitoring wells sampled are identified in Attachment 10 and their locations are illustrated on Figure 5-8. In general, sampling has been performed semi-annually except in 2012 and 2014 when annual sampling was performed. Groundwater monitoring has been conducted for COCs and other parameters (VOCs, SVOCs, total metals, dissolved iron, sulfate, and methane) required in a Memorandum of Understanding between the U.S. Army and ADEC (FES 2015h). Field measurements taken at the time of sampling include depth to water, temperature, specific conductance, DO, pH, ORP, and turbidity. Since the start of long-term monitoring in 1998, some changes to the well network have been made as a result of low yielding wells, damaged wells, and new wells that were installed from additional delineation activities. Currently, 13 wells are sampled.

Landfill Cap Inspection

An engineering evaluation of the landfill cap was conducted in 2009. It was determined to be in good condition except for a soil stockpile that was placed on the cap and a small amount of water that was pooling on the east side of an access road near the entrance gate (U.S. Army 2011).

5.7.3 Progress Since the Last Five-Year Review

The Third Five-Year Review Report (U.S. Army 2011) provided the following protectiveness statement for OU-4:

> *"The remedy at OU4 has been implemented and is protective of human health and the environment. The remedy is relying upon Monitored Natural Attenuation to achieve final cleanup goals in groundwater over time, and in the interim, exposure pathways that could result in unacceptable risks are being controlled and Institutional Controls are preventing exposure to, or ingestion of, contaminated groundwater."*

The following recommendations were provided in the Third Five-Year Review Report:

- Continue the semi-annual monitoring program to evaluate natural attenuation at the Landfill Source Area.
- Perform post-wide IC inspection and evaluate protectiveness. Update restricted use boundaries in GIS as new information becomes available.
- Develop the parameters for an Annual Report of IC effectiveness and corrective actions taken (spring 2012 milestone date).
- Update the database of LUC/IC summary documents (October 2013 milestone date), which consist of tables that describe in greater detail the ICs, the objectives to be met by the restrictions, and any specific restrictions, controls, and mechanisms.

The status of these recommendations and actions taken are discussed below.

- Semi-annual monitoring at the Landfill Source Area has been continued.
- A post-wide IC inspection is performed and results are documented in annual IC reports prepared for 2012, 2013, and 2014 (FES 2013d, 2015a, 2015f).
- Parameters for an annual report of IC effectiveness and corrective actions taken have been developed; they are used in the annual IC reports.
- Tables that describe in detail the ICs, objectives to be met by the restrictions, and any specific restrictions, controls, and mechanisms were updated and documented in annual IC reports prepared for 2012, 2013, and 2014 (FES 2013d, 2015a, 2015f).

5.7.4 Site Inspection

A site inspection was conducted by USACE on August 11, 2015 to obtain familiarity with the site, review records, examine the remedial action area, and assess protectiveness of the remedy. A completed site inspection checklist is provided in Attachment 4. Photographs are provided in Attachment 5.

Access to the landfill source area is restricted by a perimeter fence that was observed to be in good condition. Interview records and documentation indicate that the fence was damaged by vandalism in 2014 and has since been repaired. No settlement, cracking, bulges, erosion, or holes in the cap were evident. The landfill cap is vegetated with no signs of stress. Wet areas and unstable slopes were not identified. All monitoring wells were locked and appeared to be in good condition.

FWA staff indicated that LUCs/ICs are maintained as required by the ROD. The most recent IC review of the OU-4 Landfill is documented in the draft 2014 IC report (FES 2015f), which concluded:

- There was no evidence of unauthorized installation or use of groundwater wells.
- No soil disturbing activities were observed.
- Wells currently at the site are easily assessable and secured.
- Site land use and adjacent land use have not changed.

The five-year review site inspection confirmed these conclusions.

The IC report also provides an IC summary table for the site and a map (Fort Wainwright IC Boundary Map) that identifies IC boundaries.

5.7.5 Data Review

Groundwater monitoring results for site COCs since the completion of the remedial action in September 1997 are summarized in Attachment 10. They were reviewed to evaluate progress towards attaining the RAOs. Monitoring records inspected for the five-year review were available from annual sampling reports for 2012, 2013, and 2014 (FES 2013g, 2014g, and 2015h). A 2015 monitoring report was not available for review.

The monitoring well network includes six shallow wells (AP-5588, AP-8061, AP-10257, AP-10258, AP-10259, and FWLF-4), three intermediate wells (AP-5589, AP-6136, and AP-6138), and four deep wells (AP-6530, AP-6532, AP-6535, and AP-8063).

Groundwater flow in the vicinity of the landfill is affected by discontinuous permafrost regions. Mapping of October 2014 water level data provided in the 2014 monitoring report (FES 2015h) shows overall groundwater flow to the west/southwest (refer to Attachment 10, Figure 3-2).

Seven of the 13 monitoring wells contained one or more COC above the cleanup goals during the October 2014 sampling event:

- AP-5588 – cis-1,2-DCE, PCA, 1,1,2-TCA, and TCE
- AP-8063 – cis-1,2-DCE, PCA, and TCE
- AP-8061 – TCE
- AP-6530 – bis(2-ethylhexy)phthalate
- AP-6532, AP-10257, and AP-10258 – Benzene

Trend analysis was performed in this five-year review to augment and verify assessments provided in the annual sampling reports. Trend plots and trend analysis using the Mann-Kendall test are provided in Attachment 10. Results are discussed below.

Trend Analysis - Shallow Zone Wells

The highest COC concentrations and most frequent detections occur in AP-5588, which is immediately downgradient of the capped Landfill Source Area. COC concentrations decrease with distance downgradient. Decreasing trends are observed for TCE, cis 1,2-DCE in both downgradient wells (AP-5588 and AP-8061) and benzene is decreasing in AP-5588. No trend was identified in benzene data collected from AP-8061.

Data presented in the 2014 annual sampling report indicate that DO in the downgradient shallow wells was typically below 1 mg/L and ORP varied from approximately 50 millivolts (mV) to -60 mV (FES 2015h). Dissolved iron and sulfate in the downgradient wells were elevated relative to background. Geochemical conditions in the shallow zone are anoxic and suggest that manganese reducing to iron reducing conditions may be present. These conditions are suitable for reductive dechlorination of PCA, TCA, TCE, and DCE.

Trend Analysis - Intermediate Zone Wells

The highest concentrations of chlorinated VOCs and the most frequent detections occur in AP-5589, which is immediately downgradient of the capped Landfill Source Area. The concentrations decrease with distance downgradient. TCE and cis-1,2-DCE concentrations are increasing in AP-5589, while vinyl chloride and benzene are decreasing. Benzene concentrations are also decreasing in AP-6138. Bis(2-ethylhexyl)phthalate occurs most frequently and at the highest relative concentrations in AP-6136 and AP-6138.

Data presented in the 2014 annual sampling report indicate that DO in the downgradient intermediate wells was typically below 1 mg/L and ORP varied from approximately 50 mV to -72 mV (FES 2015h). Dissolved iron and sulfate in downgradient wells were elevated relative to background. Geochemical conditions in the intermediate zone are anoxic and suggest that manganese reducing to iron reducing conditions may be present. These conditions are suitable for anaerobic reductive dechlorination of TCE to cis-1,2-DCE, which may explain the increasing concentrations at AP-5589. The increasing TCE concentrations at this location may be a result of abiotic transformation of 1,1,2,2-PCA or a residual TCE plume from beneath the landfill.

Trend Analysis - Deep Zone Wells

The highest concentrations of chlorinated VOCs and the most frequent detections occur in AP-8063, which is the closest downgradient well to the capped landfill. The concentrations decrease with distance downgradient. At this well, TCE and cis-1,2-DCE concentrations are increasing, 1,1,2,2-PCA exhibits no trend, and vinyl chloride and benzene are decreasing. Benzene occurs most frequently and at the highest relative concentrations in AP-6532; where the concentrations are increasing. Benzene concentrations in AP-6530 and AP-6535, which are downgradient of AP-6532, exhibit no trend.

Data presented in the 2014 annual sampling report indicate that DO in the downgradient deep wells was typically below 1 mg/L and ORP varied from approximately 20 mV to -71 mV (FES 2015h). Dissolved iron and sulfate in downgradient wells were elevated relative to background. Geochemical conditions in the deep zone are anoxic and suggest that manganese reducing to iron reducing conditions may be present. These conditions are suitable for anaerobic reductive dechlorination of TCE to cis-1,2-DCE, which may explain the increasing concentrations at AP-8063.

Progress Towards Attaining the RAOs

The data review conducted in this five-year review has determined:

- It is too early to ascertain whether the remedy will restore groundwater to its beneficial use of drinking water quality.
- Migration of contaminants from the Landfill Source Area has been reduced.
- Reductive dechlorination, a natural attenuation process, is occurring in site groundwater.

The 2014 Annual Sampling Report provided the following long-term monitoring recommendations that were established by the RPMs during a February 2015 Federal Facility Agreement meeting (FES 2015b):

Shallow Zone Wells

- AP-5588 – conduct annual monitoring during the spring season because results do not vary significantly between the spring and fall sampling events.
- FWLF-4 – conduct annual monitoring during the spring season because COCs have not exceeded the cleanup levels since 2003.
- AP-8061 – conduct annual monitoring during the spring and fall seasons.
- AP-10257 – conduct annual monitoring during the spring and fall seasons to evaluate the presence of benzene in groundwater upgradient of the landfill.
- AP-10258 – conduct annual monitoring during the spring and fall seasons to evaluate the presence of benzene upgradient of the landfill.
- AP-10259 – discontinuing monitoring because no COCs have been detected for four consecutive sampling events.

This five-year review agrees with these recommendations; no other opportunities for optimization were identified.

Intermediate Zone Wells

- AP-5589 – conduct annual monitoring during the spring season to evaluate bis(2-ethylhexyl)phthalate that was detected above the cleanup level in June 2013.
- AP-6136 – discontinue monitoring because COCs have not been detected or detected at low concentrations below the cleanup levels since 2006.
- AP-6138 – discontinue monitoring because COCs have not been detected or detected at low concentrations below the cleanup levels since 2006.

This five-year review agrees with these recommendations; no other opportunities for optimization were identified.

Deep Zone Wells

- AP-8063 – conduct annual monitoring during the spring season because results do not vary significantly between the spring and fall sampling events.
- AP-6530 – conduct annual monitoring during the spring and fall seasons.

- AP-6532 – conduct annual monitoring during the spring and fall seasons.
- AP-6535 – conduct annual monitoring during the spring and fall seasons.

This five-year review agrees with these recommendations; no other opportunities for optimization were identified.

5.7.6 Technical Assessment

5.7.6.1 Question A

Is the Remedy Functioning as Intended by the Decision Document?

Yes, the remedy is functioning as intended by the ROD.

The landfill cap was installed in 1997 in accordance with the ROD; it covered 14 acres of the closed landfill. Groundwater monitoring has been performed since the cap was installed. The data indicate that COC concentrations decrease downgradient in all monitored zones and plume extents have not increased. The RAO to reduce further migration of contaminated groundwater from the source area is being met. The data also indicates that reductive dechlorination, a natural attenuation process, is occurring in site groundwater.

LUC/ICs have been implemented and maintained in accordance with the ROD. They prevent the use of groundwater containing contaminants at levels above federal MCLs and AWQS.

The ROD-estimated time frame to reach the cleanup goals are 70 years. It is too early to determine whether the RAOs to restore groundwater to its beneficial use of drinking water within a reasonable time frame and to attain AWQS via natural attenuation are being met. Increasing concentrations in TCE were identified in two wells; however, increasing concentrations of cis-1,2-DCE were also detected. The post remedial action monitoring period has spanned 16 years. Trend analysis indicates that downward trends are observed in 11 of the data sets and no trends are observed in 11 of the data sets. There are no increasing COC trends in shallow zone wells. One intermediate zone well, AP-5589, exhibits increasing trends for TCE and cis 1,2-DCE but at concentrations below the cleanup goals. Increasing trends are also observed for deep zone wells AP-8063 (TCE and cis 1,2-DCE) and AP-6532 (benzene). Reductive dechlorination and/or a residual plume beneath the landfill may be causing the increasing TCE and cis-1,2-DCE trends in AP-5589 and AP-8063. These increasing trends are not anticipated to affect remedy protectiveness because the LUC/ICs are in place. The deep plume of TCE is bound by three downgradient wells, AP-6530, AP-6532, and AP-6535. The deep plume of benzene is bound by two downgradient wells, AP-6530 and AP-6535.

No opportunities for optimization were identified other than those recommendations outlined in the 2014 groundwater monitoring report discussed above.

No early indicators of potential problems were identified.

5.7.6.2 Question B

Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Still Valid?

Yes, the RAOs and exposure assumptions used at the time of the remedy selection for protection of human health remain valid. The current exposures and major exposure assumptions for future potential land use at the site have not changed. The toxicity criteria used to develop risk-based cleanup goals are reviewed in Attachment 8. That attachment also evaluates the potential for vapor intrusion at the site, since it was not previously evaluated. USEPA and ADEC guidance on vapor intrusion was either developed or significantly updated within the last five years. The change in toxicity criteria for 1,1,2,2-PCA, which occurred in 2010, does not affect the protectiveness of the remedy. This constituent now has a State of Alaska MCL (4.3 µg/L) pursuant to 18 AAC 75, Table C.

Although the vapor intrusion pathway was not explicitly evaluated at this OU at the time of the ROD, there are no currently occupied buildings in the vicinity of the landfill that would warrant an evaluation for vapor intrusion concerns. The exposure assumptions established at the time of the ROD are still valid.

High quality, undisturbed ecological habitat is lacking in OU-4. The lack of complete ecological exposure pathways indicates that no further evaluation of ecological risk is needed in this OU.

5.7.6.3 Question C

Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No information has come to light that could call into question the protectiveness of the remedy for the intended use of the property as described in the ROD; however, the USEPA has identified 1,4-dioxane as an emerging contaminant.

An assessment has not been performed at OU-4 to evaluate whether a release of the stabilizer 1,4-dioxane occurred. A recommendation to perform sampling is included below; however, this issue is not anticipated to affect protectiveness based on the following information:

- LUCs/ICs have been implemented preventing receptors from direct contact with subsurface contaminants at OU-4.
- A hypothetical USEPA VISL was calculated for 1,4-dioxane (530,000 µg/L). This value is over four orders of magnitude greater than a VISL calculated for TCE under the same conditions (15 µg/L). ADEC does not have a VISL for 1,4-dioxane (VISL for TCE in groundwater is 5.2 µg/L). Based on this information, 1,4-dioxane should not pose a risk via vapor intrusion where no risk is identified for TCE.
- Groundwater flow in the vicinity of the Landfill is influenced significantly by a thick, continuous permafrost west of the Landfill, and highly variable permafrost south of the Landfill. The near-surface permafrost retards groundwater movement within the shallow subsurface. Shallow/intermediate groundwater flow above the permafrost is to the west while deep groundwater flow (subpermafrost aquifer) is to the southwest.
- Groundwater contaminant concentrations at the Landfill are relatively low.
- The closest drinking water supplies include:
    - The Golden Heart Utilities has four water supply wells (AK2310730 - community) located 3.25 miles from the OU-4 Landfill on the banks of the Chena River. These wells are separated from the OU-4 Landfill via hydrogeologic divide (Chena River).
    - The system operator was contacted on 27 October 2016 to request monitoring data for 1,4-dioxane as required for this system under the Unregulated Contaminant Monitoring Rule 3 (UCMR3). The operator indicated that the

system was sampled for 1,4-dioxane twice in 2013 (February and August), however, the sampling point was at the entry point to the distribution system (post-treatment). The results indicate that no 1,4-dioxane was detected in the water samples at concentrations above the laboratory's minimum reporting limit of <0.07 µg/L. No raw water quality data was available for 1,4-dioxane.

  - Pioneer drinking water wells (AK2310714 - community) for the Hamilton Subdivision are located approximately 1.6 miles from the OU-4 Landfill (see Figure 3-1). Given the current plume extents and magnitude as well as the location of permafrost, migration of groundwater contaminants from the vicinity of the Landfill 1.6 miles to the Pioneer wells is highly unlikely.
  - The installation has eight on-post wells (AK2310918 - community) and one well servicing the golf course (AK2311095 - non-community). In addition to those wells identified by the State, an emergency water supply well is located within the OU-2 DRMO Yard (see Section 5.3). The well locations are depicted on Figure 3-1. Only one well located on FWA is currently designated as a drinking water source (Building 3559 Water Well). This well is separated from the OU-4 Landfill via hydrogeologic divide (Chena River).

- The Chena River is located approximately 1,800 feet southwest of the OU-4 Landfill. Based on the site conceptual model, impacts associated with the Landfill are not anticipated to impact the Chena River.
- No other sensitive receptors were identified.

5.7.6.4 Technical Assessment Summary

The OU-4 landfill cap was installed in 1997, groundwater monitoring is performed on a routine basis, and ICs have been implemented and are maintained as required by the ROD. The landfill cap and ICs prevent the exposure of receptors to groundwater impacts. Groundwater monitoring indicates that the remedy has effectively reduced migration of groundwater impacts and that reductive dechlorination is taking place. It is too early to assess whether the remedy will achieve the groundwater cleanup goals. No changes in the ARARs or risk assessment were identified that would affect the protectiveness of the remedy.

5.7.7 Issues

The following issue was identified at the OU-4 Landfill that may affect the future protectiveness of the remedy:

- An assessment for 1,4-dioxane has not been performed at the Landfill.

The following site-wide concern was identified that does not affect the protectiveness of the FWA remedies:

- The site-wide SOP does not include documentation and information regarding all LUCs required throughout FWA.

5.7.8 Recommendations for Follow-up Actions

The following recommendation for follow-up action was identified that may affect the future protectiveness of the remedy:

- Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the Landfill. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.

The following site-wide recommendation was identified that does not affect the protectiveness of the FWA remedies:

- The U.S. Army should develop a revised site-wide IC program to include LUC/IC requirements. This will be initiated in November 2016 with a planned completion date of September 2018.

5.7.9 Protectiveness Statement

The remedy at OU-4 Landfill currently protects human health and the environment because:

- Further migration of contaminated groundwater from the source area has been reduced by the implemented remedy and natural attenuation.
- ICs are in-place to ensure that contaminated groundwater will not be used until the cleanup goals are attained.

However, in order for the remedy to be protective in the long-term, the following action needs to be taken to ensure protectiveness:

- Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the Landfill. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.

5.8 OU-4 Coal Storage Yard

5.8.1 Background Information

5.8.1.1 Physical Characteristics

The OU-4 Coal Storage Yard is situated south of a coal fired cogeneration power plant that was used as the sole source of heat and electricity for FWA (U.S. Army 1996). The area of concern was approximately 800 ft by 300 ft and located between a cooling pond and embankment. Coal was stored directly on the ground since the 1950s. From the 1960s to 1993 the pile was sprayed with waste petroleum fuel products and waste solvents to increase the thermal content of the coal and power plant output. Three USTs were located in the area. Two were used for the storage of waste fuel products. They were installed in the 1980s and removed in July, 1995. The third UST was used to store diesel fuel for power plant equipment (CH2M HILL 2003a). Prior to installation of the tanks waste oil was placed in drums adjacent to the coal pile (U.S. Army 2011). The coal storage yard site features are shown in Figure 5-9.

Areas north and east of the coal storage yard are industrial and areas to the south and west contain mixed hardwood forests (U.S. Army 1996b). An unlined cooling pond is located immediately west of the coal storage yard, it is used for storage of cooling water circulated from the power plant.

FWA is underlain by soil and sediment that consists of silt, sand, and gravel that range from 10 ft to 400 ft thick. Discontinuous permafrost occurs at depths of 3 ft to more than 50 ft and is more prevalent north of the Chena River (U.S. Army 1996b).

The coal storage yard is located within a 500 year floodplain. Groundwater occurs at approximately 11 to 12 ft bgs and varies seasonally by several ft. Groundwater flows northwest at estimated velocities that range from 243 ft per year to 2,917 ft per year (U.S. Army 1996b). The cooling pond is hydraulically connected to the groundwater aquifer. Permafrost was not encountered during investigations at the coal storage yard.

No endangered or threatened species reside in the area (U.S. Army 2011).

5.8.1.2 Land and Resource Use

The site is still used for coal storage. It is located in a restricted area that is not developed. Current land use is light industrial. Water supply wells for FWA are located downgradient of the site, approximately 900 ft to the northwest. Groundwater use is considered residential because water supply wells for the City of Fairbanks are located in the same aquifer where contamination was identified at the coal storage yard (U.S. Army 2006).

5.8.1.3 History of Contamination

The primary sources of contamination at the coal storage yard were associated with waste fuel products that were sprayed on the coal pile, the storage of these waste fuel products, leaks from the USTs, and the coal pile. Soil and groundwater contamination were identified during a RI. Soil sampling was conducted at the coal storage yard between 1999 and 2002, and groundwater sampling was performed semi-annually (spring and fall) until 2003 (U.S. Army 2006).

5.8.1.4 Initial Response

No pre-ROD cleanup activities or response actions were performed at the site.

5.8.1.5 Basis for Taking Action

Previous investigations determined that the former coal storage yard source area contained several relatively small and discontinuous contaminated soil zones that were attributed to the practice of applying oil to the coal pile and leaks from the three USTs. Soil contaminants consisted of petroleum hydrocarbons (diesel fuel) and TCE. No risks greater than 1 x 10^{-6} or a hazard quotient of one were associated with current or future use of the soils (U.S. Army 1996).

Groundwater contained benzene, TCE, and bis(2-ethylhexly)phthalate above federal drinking water MCLs and USEPA RBCs (CH2M HILL 2003a). Risks associated with potential downgradient drinking water users exceeded an excess lifetime cancer risk of 1 x 10^{-4} (U.S. Army 1996b).

5.8.2 Remedial Actions

5.8.2.1 Remedy Selection

The following RAOs were established for soil and groundwater in the August 1996 ROD:

Soil

- Prevent migration of soil contaminants to groundwater that could result in groundwater contamination and exceedances of federal MCLs and AWQS (18 AAC 70).

Groundwater

- Restore groundwater to its beneficial use of drinking water quality within a reasonable time frame (estimated at 9 years).
- Reduce further migration of contaminated groundwater from the source areas.
- Prevent use of groundwater containing contaminants at levels above federal MCLs and AWQS (18 AAC 70).
- Use natural attenuation to attain AWQS (18 AAC 70).

COCs and site cleanup goals for soil and groundwater are identified in Table 5-15; they represent USEPA and State of Alaska MCLs.

Table 5-15 OU-4 Coal Storage Yard Soil and Groundwater COC Cleanup Goals

COC	Cleanup Goal	Basis
Surface and Subsurface Soils		
Benzene	0.5 mg/kg	ADEC[1]
BTEX	15 mg/kg	ADEC[1]
DRO	200 mg/kg	ADEC[1]
GRO	100 mg/kg	ADEC[1]
Groundwater		
Benzene	5 µg/L	USEPA MCL [2]
bis(2-Ethylhexyl) phthalate	6 µg/L	USEPA MCL [2]
Toluene	1,000 µg/L	USEPA MCL [2]
TCE	5 µg/L	USEPA MCL [2]

Notes:

1 ADEC Method One (18 AAC 75, Table A1), based on a Site Matrix Score of 39.
2 40 CFR 141.61

The selected remedy included the following components:

AS/SVE

- *In situ* treatment of groundwater via AS to remove VOCs; AS points would be located in areas of highest contamination.
- *In situ* treatment of soil via SVE; SVE wells would be located in areas of highest contamination and operated until the groundwater MCLs were achieved.
- Evaluation and modification of the AS/SVE system as necessary to optimize its effectiveness in achieving RAOs.

The AS/SVE system was designed to operate during May through October and was estimated to require nine years to achieve the cleanup goals.

Monitoring

- Natural attenuation to achieve the AWQS after the AS/SVE system was shut down.
- Monitoring of nested downgradient wells during the remedial action to ensure protection of FWA drinking water supply wells.

Institutional Controls

- Maintaining ICs that included access restrictions and well development restrictions as long as hazardous substances remained on site at levels that precluded unrestricted use. Restrictions on groundwater would be implemented until contaminant levels were below the federal MCLs and AWQS.

5.8.2.2 Remedy Implementation

The AS/SVE system was installed in 1997; it consisted of 27 AS points and 14 SVE wells. The system was shut down in October 2000 to perform a rebound study. Soil sampling conducted in 2002 did not identify residual contamination in the source area and groundwater concentrations did not rebound. The treatment system was decommissioned in 2004 (U.S. Army 2006).

Groundwater monitoring was performed semi-annually during operation of the treatment system. COCs were not detected in groundwater at concentrations greater than the MCLs after 2001. The RPMs decided to discontinue the monitoring program in 2003 because the RAOs had been met (U.S. Army 2006).

ICs were implemented; they consisted of access restrictions that included posted signs, deed restrictions on future land use, restrictions on groundwater well installation, and well use advisories. Significant elements of the FWA base-wide IC policy include project planning procedures, dig clearance requirements, standard operating procedures associated with LUC/ICs, and incorporation of LUC/IC details in a FWA GIS database. LUC/ICs are still in effect at the coal storage yard. Excavation and groundwater intrusion are restricted and may only be authorized by FWA Directorate of Public Works, Environmental Department (U.S. Army 1996b).

The coal storage yard was recommended for NFA in the second FWA five-year review (U.S. Army 2011).

5.8.2.3 Operation, Maintenance and Monitoring

Operation, maintenance and monitoring activities are no longer necessary at the site.

5.8.3 Progress Since the Last Five-Year Review

The Third Five-Year Review Report (U.S. Army 2011) provided the following protectiveness statement for OU-4:

> *"The remedy at OU4 has been implemented and is protective of human health and the environment. The remedy is relying upon Monitored Natural Attenuation to achieve final cleanup goals in groundwater over time, and in the interim, exposure pathways that could result in unacceptable risks are being controlled and Institutional Controls are preventing exposure to, or ingestion of, contaminated groundwater."*

The following recommendations were provided in the Third Five-Year Review Report:

- Perform post-wide IC inspection and evaluate protectiveness. Update restricted use boundaries in GIS as new information becomes available.
- Develop the parameters for an annual report of IC effectiveness and corrective actions taken (spring 2012 milestone date).
- Update the database of LUC/IC summary documents (October 2013 milestone date), which consist of tables that describes in greater detail the ICs, the objectives to be met by the restrictions, and any specific restrictions, controls, and mechanisms.

The status of these recommendations and actions taken to address them are discussed below.

- A post-wide IC inspection is performed and results are documented in annual IC reports prepared for 2012, 2013, and 2014 (FES 2013d, 2015a, 2015f).
- Parameters for an annual report of IC effectiveness and corrective actions taken have been developed; they are used in the annual IC reports.
- Tables that describe in detail the ICs, objectives to be met by the restrictions, and any specific restrictions, controls, and mechanisms were updated and documented in annual IC reports prepared for 2012, 2013, and 2014 (FES 2013d, 2015a, 2015f).

5.8.4 Site Inspection

A site inspection was conducted by USACE on August 11, 2015 to obtain familiarity with the site, review records, examine the remedial action area, and assess protectiveness of the remedy. Site access was limited due to construction activities in the area. The site was viewed where possible; it is being used for coal storage. The west side of the site is fenced and developed for light industrial use with restricted access. A completed site inspection checklist is provided in Attachment 4. A photograph is provided in Attachment 5.

FWA staff indicated that LUCs/ICs are maintained as required by the ROD.

The most recent IC review of OU-4 Coal Storage Yard is documented in the draft 2014 IC report (FES 2015f), which concluded:

- There was no evidence of unauthorized installation or use of groundwater wells.
- No soil disturbing activities were observed.
- Site land uses and adjacent land use have not changed.

The five-year review site inspection confirmed these conclusions.

5.8.5 Data Review

There is no new operation, maintenance or monitoring data since the previous five-year review.

5.8.6 Technical Assessment

5.8.6.1 Question A

Is the Remedy Functioning as Intended by the Decision Document?

Yes, the remedy is functioning as intended by the ROD. The estimated timeframe to achieve the cleanup goals at the Coal Storage Yard was 9 years. The remedy was implemented and the remedial action is complete. Soil and groundwater cleanup goals have been attained. Groundwater monitoring was discontinued in 2003. The AS/SVE system was shut down in 2000 and decommissioned in 2004. The second five-year review recommended NFA for the site.

LUC/ICs have been implemented and are functioning as intended.

Opportunities to improve the performance or reduce monitoring costs were not identified in the five-year review.

No early indicators of potential problems were identified.

5.8.6.2 Question B

Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Still Valid?

Yes, the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy are still valid.

All soil and groundwater cleanup goals were ARAR-based. There are no newly promulgated or modified requirements of federal and state environmental laws that would change the protectiveness of the groundwater and soil remedies implemented at the coal storage yard. An ARAR assessment is provided in Attachment 7.

LUC/ICs are still in place, they restrict site access and groundwater use. The exposure assumptions established at the time of the ROD are still valid. The coal storage yard is an industrial use property where little undisturbed high-quality ecological habitat exists. A complete ecological exposure pathway that would warrant evaluation of ecological risk is lacking. A risk assessment and toxicology assessment is provided in Attachment 8.

5.8.6.3 Question C

Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No other information has come to light that could call into question the protectiveness of the remedy as described in the ROD.

5.8.6.4 Technical Assessment Summary

The AS/SVE system was installed in 1997 and operated seasonally until 2000. ICs were implemented and maintained as required by the ROD. MNA was evaluated following the AS/SVE system shut down. RAOs were achieved in 2003 and groundwater monitoring was discontinued. No changes in ARARs or the risk assessment were identified that would affect the protectiveness of the remedy.

5.8.7 Issues

No issues were identified at the OU-4 Coal Storage Yard that affect protectiveness of the remedy.

The following issue that does not affect the protectiveness of the OU-4 Coal Storage Yard remedy was identified:

- The remedial action has attained all RAOs and groundwater cleanup goals (for residential use) identified in the OU-4 ROD. The site meets unlimited use and unrestricted exposure criteria identified in the ROD.

5.8.8 Recommendations for Follow-up Actions

The remedial action has attained all RAOs and groundwater cleanup goals. The site meets unlimited use and unrestricted exposure criteria identified in the ROD. No recommendations for follow-up action affecting the protectiveness of the remedy were identified.

The following recommendations for follow-up actions do not affect protectiveness of the remedy:

- An iRACR should be completed to document remedial action completion under CERCLA and five-year reviews should be discontinued. If the site retains IC restrictions, the five-year review must be conducted to evaluate that component of the remedy.

5.8.9 Protectiveness Statement

The remedy at OU-4 Coal Storage Yard is protective of human health and the environment because all RAOs have been attained.

5.9 OU-5 West Quartermaster's Fueling System

5.9.1 Background Information

The WQFS was divided into four subareas: WQFS1, WQFS2, WQFS3, and WQFS4. Contaminated soil in WQFS4 is addressed under the 2-PTY program and is not included in the OU-5 remedial actions. Contaminated groundwater beneath WQFS4 is being addressed in OU-5.

5.9.1.1 Physical Characteristics

The WQFS area covers approximately 50 acres and is bordered to the north by a south trending meander of the Chena River, to the west by the ROLF, to the south by Taxiway 18, and to the east by the EQFS (Figures 2-1 and 5-10). The terrain is open tussock flats as the buildings have all been removed from the site. The WQFS is located within the 500-year floodplain of the Chena River. No endangered or threatened species reside in the area. Groundwater is located approximately 15 to 17 ft bgs.

5.9.1.2 Land and Resource Use

Current land use in the WQFS is light industrial; current and future groundwater use is considered residential because water supply wells for the City of Fairbanks are located in the same unconfined aquifer. The closest residences to WQFS are approximately one mile west. The residential area includes a school. Access to WQFS is unrestricted and the area is used for recreational purposes that includes a bicycle trail. Access to the Chena River is unrestricted.

5.9.1.3 History of Contamination

Activities within the WQFS included vehicle and aircraft maintenance operations and the associated use and disposal of solvents and other cleaning and maintenance compounds. The WQFS also included USTs and ASTs, a pump house and fueling islands. Drains within the WQFS were connected to a wood-stave pipe that drained to the river. The underground fuel pipelines and a network of aboveground and buried fuel piping were abandoned in place. All pipelines were reported to be cleaned before they were abandoned. Several leaking drums containing a tarry substance were exposed along the Chena River and removed in 1995; nine nearby buried drums and approximately 3 CY of contaminated soil were excavated in 1996. The primary sources of contaminants in groundwater at WQFS were from surface disposal of solvents, petroleum spills and leaks, and other past disposal practices.

Groundwater contamination extended approximately 70 ft bgs or 60 ft below the water table. The approximate extent of groundwater contamination was 43 acres. Initial investigations conducted at the WQFS revealed four groundwater plumes. Two free product plumes (mostly jet fuel and diesel fuel) existed within the source area. The larger plume was about 4½ acres and encompassed an area where the majority of fuel pumps, dispenser islands, and storage tanks were located. The smaller free product plume extended about 600 ft southwest of Building 1599 and coincided with a bermed area around a possible fuel containment structure. A benzene plume covered about 25 acres. A plume of 1,2-DCA extended from the north of Front Street to the Chena River, overlapping the free product and benzene plumes and extended to a depth of approximately 20 ft bgs. DRO and GRO were also detected, but their extent was not defined.

Soil contamination in WQFS subareas was estimated at approximately 150,600 CY.

5.9.1.4 Initial Response

Removal or treatability studies completed prior to the 1999 ROD include the following:

- In 1980, the U.S. Army excavated a trench in WQFS2 near the bank of the Chena River and installed a sheet metal retaining structure to prevent further migration of fuel leaks into the Chena River.
- Several leaking drums containing a tarry substance at WQFS3 were exposed along the Chena River and removed in 1995; nine nearby buried drums and approximately 3 CY of contaminated soil were excavated in 1996.
- In 1998 approximately 700 CY of contaminated soil and a sheet metal retaining structure was removed from WQFS2. An AS curtain was installed in this area to minimize contaminant migration into the Chena River and a harbor and absorbent boom system was deployed to contain any potential sheen in the Chena River during ice-free months.
- Between 1996 to 1998, several treatability studies were initiated to evaluate technologies that were considered for incorporation into WQFS remediation plans:
    - AS/SVE with horizontal wells in WQFS1
    - Source Area AS/SVE in WQFS1
    - *In-situ* soil heating in WQFS1 using radio frequency and six-phase heating to heat soil and enhance biodegradation and volatilization (completed in 1999 with mixed success)
    - *In-situ* ORC in WQFS2 to enhance the rate of reduction of VOCs (completed with limited success)
    - Bench-scale tracer and biodegradation studies conducted to better understand the persistence of the contamination

5.9.1.5 Basis for Taking Action

Based on the results of the baseline risk assessment that assumed industrial use of soil and residential use of groundwater, COCs were identified in the 1999 ROD (U.S. Army 1999). They are provided in Table 5-16.

Table 5-16 OU-5 WQFS COCs

Media	COC
Groundwater	RRO
	DRO
	GRO
	1,2-DCA
	Benzene
	Toluene
Soil	DRO
	GRO
	Benzene
	Ethylbenzene
	Toluene
	Xylenes

Table 5-16 OU-5 WQFS COCs

Media	COC
Chena River Surface Waters	TAH
	TAqH

Note:

TAqH total aqueous hydrocarbons

5.9.2 Remedial Actions

5.9.2.1 Remedy Selection

The following RAOs were established in the OU-5 ROD:

Groundwater

- Restore groundwater to its beneficial uses within a reasonable time frame. Reduce or prevent further migration of contaminated groundwater from the source areas to the downgradient aquifer or surface water bodies that are closely hydrologically connected by achieving MCLs (where there are no nonzero maximum contaminant level goals [MCLGs]) and AWQS. For groundwater that is hydrologically connected to surface water, AWQS will apply for the following fresh water uses: (l)(A) Water Supply; (l)(B) Water Recreation; and (l)(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife.
- Ensure there is no risk to aquatic receptors through control of contaminant movement through the groundwater into the Chena River.
- Remove light non-aqueous phase liquid (LNAPL) to the extent practicable to eliminate film or sheen from groundwater.
- Prevent use of groundwater containing contaminants at levels above SDWA MCLs, non-zero MCLGs, or the following AWQS for fresh water uses: (l)(A) Water Supply; (l)(B) Water Recreation; and (l)(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife.

Soil

- Prevent the migration to groundwater of soil contaminants that could result in groundwater contamination and exceedances of federal MCLs and nonzero MCLGs and to groundwater that is closely hydrogeologically connected to surface water (such as the Chena River) that could result in exceedances of AWQS in surface water.

Chena River Sediments and Surface Water

- Reduce sources of contaminant releases to the Chena River
- Meet AWQS for the following fresh water uses: (1)(A) Water "J Supply; (1)(B) Water Recreation; and (1)(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife.
- Continue aquatic assessment

Several treatability studies were implemented at WQFS prior to release of the 1999 ROD. The purpose of the studies was to evaluate the effectiveness of the systems and/or to collect additional data for system modification. The remedies selected are described below.

Chena River Aquatic Assessment

- Perform an aquatic assessment of the Chena River during the spring and fall. It includes collecting water, sediment, and detritus (organic leaf litter) samples and analyzing them for contaminants of concern and water chemistry.
- Collect benthic macroinvertebrates such as insects and larvae and analyzing them through toxicological studies and bioassays.
- Determine the reductions of contaminant load into the Chena River from remedial actions and associated changes to aquatic organisms.

Institutional Controls

The OU-5 ROD required the U.S. Army to develop standard operating procedures (SOPs) to identify all land areas under restriction, identify the objectives that must be met by the restrictions, and specify the particular restrictions, controls, and mechanisms to be used to achieve the identified objectives. The SOPs were intended to help assure that the ICs selected in this and other OU RODs were carried out and remain in place until the USEPA, ADEC, and the U.S. Army determine they are no longer needed to protect the public and the environment. The SOPs serve as a single site-wide source documenting all ICs being implemented at FWA. The OU-5 ROD also indicates that the SOPs will be a component of the five year review process.

Components of the selected remedy are discussed below.

WQFS1, WQFS 2, and WQFS3

- *In-situ* soil heating (after the ROD was signed, it was determined that soil heating was not cost effective) (WQFS 1 only).
- Installation of an AS/SVE system.
- Installation of an AS curtain near the bank of the Chena River (WQFS 2 only).
- ICs including restrictions governing site access, on-site construction, and groundwater use.
- Groundwater monitoring including monitored natural attenuation for deep groundwater and areas not actively treated.

The ROD also required that abandoned buried fuel pipelines be purged of residual fuel to eliminate the potential for the lines to act as ongoing contaminant sources.

The cleanup goals identified in the ROD for COCs in groundwater, surface water, and sediment are presented in Table 5-17.

Table 5-17 OU-5 WQFS COC Cleanup Goals

Media	COC	Cleanup Goal
Groundwater	RRO	1,110 µg/L
	DRO	1,500 µg/L
	GRO	1,300 µg/L
	1,2-DCA	5 µg/L
	Benzene	5 µg/L
	Toluene	1,000 µg/L
	Floating-product petroleum hydrocarbons	Eliminate sheen
Soil	DRO	Active remediation of soils until contaminant levels in groundwater are consistently below state and federal MCLs
	GRO	
	Benzene	
	Ethylbenzene	
	Toluene	
	Xylenes	
Chena River Surface Water	TAH	10 µg/L
	TAqH	15 µg/L
	Petroleum hydrocarbons	Eliminate sheen
	COCs identified in the Post-wide risk assessment	Benthic macroinvertebrates assessment to establish baseline and monitor aquatic biotic integrity over time[1]
Chena River Sediments	Contaminated sediments that contain all COCs identified in the post-wide risk assessment	No concentration of toxic substances or petroleum hydrocarbons and other contaminants in bottom sediments allowed that cause deleterious effects to aquatic life
		Benthic macroinvertebrates assessment to establish baseline and monitor aquatic biotic integrity over time[1]

Note:

1 The Chena River Aquatic Assessment Program was conducted to evaluate the impact from contamination on the benthic communities. It found evidence that contamination from the FWA source areas was potentially adversely influencing biotic health in the Chena River ecosystem but did not prove that sediment toxicities caused changes in the benthic invertebrate communities of the Chena River. As a result, the program was discontinued. This decision is documented in the second Five-Year Review (U.S. Army 2006); however, the second Five-Year Review also notes that it is unlikely that decreases in sediment concentrations of PAHs detected in Seep Area samples were attributable to remediation efforts at OU-5. The Review indicated that these relatively low PAH concentrations may reflect souring flood events between 1997 and 2002, and low-flow conditions during the 1997 and 1998 sampling events.

The ROD estimated time frames to reach the cleanup goals are (U.S. Army 1999):

- WQFS1 – two years (source area) and 10 years (at the Chena River)
- WQFS2 – five years (source area) and five to 10 years (at the Chena River)
- WQFS3 – five years (source area) and five to 10 years (at the Chena River)

5.9.2.2 Remedy Implementation

Three AS/SVE systems (Horizontal Well, Source Area, and Sparge Curtain) were operated at the WQFS.

WQFS1

- A horizontal well AS/SVE system was installed in 1997 and expanded through 2001 to include 170 AS probes and 47 SVE wells.
    - Between 1997 and 2005, the system removed 275,000 pounds of petroleum hydrocarbons.
    - In 2005, groundwater contaminant concentrations showed a decreasing trend in the treatment zones and VOC removal rates decreased. The system was shut down in November 2005 for a rebound study.
    - In 2009, an evaluation of soil contamination remaining was performed using an ultra-violet light optical screening tool (UVOST) and soil sampling. The results indicated that the extent of soil contamination was similar to the extent identified in the RI. The primary contaminant was DRO and the majority of the remaining soil contamination was associated with the smear and saturated zones.
    - In 2011, the AS/SVE system was decommissioned.
- A source area AS/SVE system, installed in 1998, was expanded through 2001 to include 123 AS and 21 SVE wells.
    - Between 1998 and 2005, the system removed 162,000 pounds of VOCs.
    - In 2005, groundwater contaminant concentrations showed a decreasing trend in the treatment zones and VOC removal rates decreased. The system was shut down in November 2005 for a rebound study.
    - In 2009, an evaluation of soil contamination remaining was performed using UVOST and soil sampling. The results indicated that the extent of soil contamination was similar to the extent identified in the RI. The primary contaminant was DRO and the majority of the remaining soil contamination was associated with the smear and saturated zones.
    - In 2011, the AS/SVE system was decommissioned.

WQFS2

- A sparge curtain AS/SVE system was installed in 1998 to intercept and treat groundwater prior to migration to the Chena River. It consisted of four treatment zones.
    - The SVE portion of the system was shut down in January 2004 due to diminishing contaminant recoveries. The AS system was operated until 2012 when it was shut down due to a mechanical failure.

- In 2009, an evaluation of remaining soil contamination was performed using UVOST. The results indicated that contaminated soil extended from the bank of the Chena River south towards Gaffney Road, with depths ranging from the smear zone to the saturated zone in areas where previous excavation took place to some vadose zone and smear zone/saturated zone contamination south of the excavation area.
- In 2013, the RPMs agreed to keep the system off for a rebound study. In response to the 2015 OU-5 monitoring report, ADEC recommended leaving the AS curtain in place until an evaluation of contaminant migration is complete. The U.S. Army agreed to delay decommissioning of the AS curtain treatment system until data from a new monitoring well can be evaluated.

WQFS3

- An additional AS/SVE system was installed in 2000 (using the mechanical equipment from a system in WQFS2) and operated between 2001 and 2003. It was shut down because benzene in groundwater met the cleanup goal.

It is estimated that the AS/SVE systems collectively removed over 450,000 pounds of VOCs, as well as measurable free product on the water table. To supplement the active systems, several treatability studies also were completed, including ISCO injections and *in-situ* soil heating.

Chena River Harbor Boom

The Chena River harbor boom was installed in 1998 and is deployed every year between May and October. The OU-5 ROD does not include the boom. However, regulatory concurrence documented in the first five-year review report acknowledged that the boom will be maintained until RAOs will be met.

Pipeline Abandonment/Removal

Abandoned and buried fuel lines in the WQFS were pigged, emptied, and capped in 2000. Several hundred ft of lines also were removed in 2004 and 2005. All known pipelines have been removed and cleaned; however, in case any remaining pipelines are discovered, the U.S Army has an ongoing project to identify and remove fuel from them.

Groundwater Monitoring and Natural Attenuation Evaluation

Groundwater monitoring has been performed semi-annually between 1999 and 2009, with the number of wells sampled varying between 21 and 43. Following shut down of the AS/SVE systems, contaminant rebound evaluations have shown limited rebound of EDB, GRO, and benzene in the horizontal well and the source areas, and benzene in the sparge curtain source area. DRO is the primary COC remaining above the cleanup goal in all source areas and benzene remains above cleanup goal primarily in the former horizontal well source area.

Institutional Controls

The OU-5 ROD required the U.S. Army to develop SOPs to identify all land areas under restriction, identify the objectives that must be met by the restrictions, and specify the particular restrictions, controls, and mechanisms to be used to achieve the identified objectives. The SOPs were intended to help assure that the ICs selected in this and other OU RODs were carried out and remain in place until the USEPA, ADEC, and the U.S. Army determine they are no longer needed to protect the public and the environment. The SOPs serve as a single site-wide source documenting all ICs being implemented at FWA. The OU-5 ROD also indicates that the SOPs will be a component of the five year review process.

ICs are maintained to ensure that groundwater will not be used until MCLs are attained. They include restrictions governing site access, construction, and water supply well installation, as long as hazardous substances remain on site at levels that preclude unlimited use and unrestricted exposure. Signs have been installed to inform the public of restrictions and activities in this area.

ICs are inspected annually and a complete summary of the survey and corrective actions taken are presented in an annual IC report. The first annual report was prepared for 2012 (FES 2013h) and prior IC inspections were documented in the OU-specific annual monitoring reports. IC inspections evaluate potential land use changes, site security (monitoring wells, etc., as applicable), or unauthorized groundwater use. In addition, reviews of the FWA IC GIS layer and the site-specific information in the ADEC contaminated sites database are conducted.

5.9.2.3 Operation, Maintenance and Monitoring

There are no active remediation systems operating at the OU-5 WQFS. Maintenance activities are limited to monitoring well inspections and weekly inspection of the seasonal Chena River harbor boom when it is deployed (between May and October). The results of harbor boom inspections are presented in the annual OU-5 monitoring reports.

During the annual groundwater sampling events, monitoring wells are inspected to ensure that they are accessible, locked, and in good condition. Results of the inspections are presented in the annual monitoring reports. Over the last several years, activities have included replacing well locks and adjusting well risers that were impacted by frost.

Currently, groundwater monitoring is performed as follows (see Figure 5-10 for well locations):

- Annual sampling in all areas of the WQFS except the sparge curtain source area, where sampling is performed semi-annually (only one round of samples was collected in 2014 in the sparge curtain area due to contractual issues).
- 10 wells are sampled to monitor the DRO plume; five wells are sampled along the Chena River; nine wells are sampled in the sparge curtain area; and 11 wells are sampled to monitor benzene concentrations.
- Groundwater samples in the WQFS are analyzed for DRO, GRO, VOCs (benzene, toluene, TCE, 1,2-DCA), EDB (select wells only), and geochemistry parameters. Samples from the sparge curtain area are also analyzed for PAHs.

The VOC analysis includes benzene, toluene, TCE, 1,2-DCA, and EDB (a non-ROD constituent).

5.9.3 Progress Since the Last Five-Year Review

The Third Five-Year Review Report (U.S. Army 2011) provided the following protectiveness statement for OU-5:

> *"The remedy at OU5 currently protects human health and the environment because Institutional Controls are preventing exposure to, or ingestion of, contaminated groundwater. However in order for the remedy to remain protective for the long term,*

continued monitoring of the Remedial Area 1a fence will be conducted to ensure security and identify the need for repairs."

Recommendations provided in the Third Five-Year Review Report and progress made to address them are identified below.

Recommendation: Continue the operation of the AS curtain and seasonal use of the boom along the Chena River.

Progress: Due to mechanical failure, the AS curtain system was shut down in February 2012 and the RPMs agreed to initiate a groundwater contaminant rebound study. In 2013, the RPMs agreed to decommission the system when funds are available. The Chena River boom is deployed annually between May and October. Wells in the sparge curtain area were sampled semi-annually through 2014 and were sampled twice in 2015.

Recommendation: Continue sampling monitoring wells within the Horizontal Well and Source Area source areas annually, and wells associated with the sparge curtain and along the bank of the Chena River semi-annually.

Progress: Monitoring wells have been sampled annually within the horizontal well area and source area. The sampling frequency for the wells along the Chena River was reduced from semi-annual to annual, based on agreement of the RPMs in 2012.

Recommendation: Continue LTMO analysis on an annual basis.

Progress: The LTMO is performed annually and the results are included in annual monitoring reports.

Recommendation: Decommission the horizontal well and source area treatment systems.

Progress: TheWQFS1 horizontal well and source area treatment systems were decommissioned in 2011. This activity was documented in a 2011 Technical Memorandum (FES, 2011c).

Recommendation: Complete additional soil and groundwater investigation to evaluate the extent of benzene remaining above cleanup levels in the horizontal well area.

Progress: Following soil sampling conducted in 2011, an ISCO treatability study was performed (details are provided below).

Recommendation: Conduct additional evaluation of the AS curtain performance and potential contaminant migration into the Chena River.

Progress: A Sparge Curtain Performance Monitoring Plan (PMP) was prepared in response to a request made during the annual RPM meeting in 2012 (details are provided below).

Recommendation: Notify USEPA and ADEC in a timely manner when systems are not operating.

Progress: There are no active systems currently operating at the WQFS.

Recommendation: Implement IC measures that include: 1) performing a post-wide IC inspection and evaluating protectiveness, 2) updating restricted use boundaries in GIS as new information becomes available, 3) developing the parameters for an Annual Report of IC effectiveness and corrective actions taken, and 4) updating tables that describes in greater detail the ICs, the objectives to be met by the restrictions, and any specific restrictions, controls, and mechanisms.

Progress: These activities have been completed and are documented in annual IC reports prepared for 2012, 2013, and 2014 (FES 2013d, 2015a, 2015f).

To investigate the extent of benzene remaining above the cleanup goal in the horizontal well area, soil samples were collected in 2011 and up to 650 CY of benzene contaminated soil, primarily in the smear zone, were thought to be contributing to persistent groundwater contamination. To treat this hot spot area, an ISCO treatability study was initiated in 2012. The treatability study included the installation of 10 temporary wells to delineate the plume and the injection of three rounds of an ISCO product in September 2012, October 2012, and October 2013.

Three permanent monitoring wells were installed in the vicinity of the sparge curtain system in 2011. These wells are identified as AP-10220MW, AP-10221MW, and AP-10222MW (Figure 5-10).

A Sparge Curtain PMP was prepared in response to a request made at the annual RPM meeting in 2012. The purpose of the PMP was to provide a decision-making framework for interpretation of the results from site activities, optimize site activities to minimize long-term operation and monitoring cost while maintaining protectiveness of the Chena River, and document the progress towards achieving remedial goals. Data collection activities were conducted in 2012 to evaluate the performance and effectiveness of the Chena River boom (e.g., detailed visual sheen monitoring, collection of surface water, groundwater, and sediment samples adjacent to the boom, and an evaluation of dissolved contamination using a passive sampling technique). This data, along with sparge curtain system data, were used to develop the PMP, which is updated annually. Three objectives were identified in the PMP: (1) evaluate the effectiveness of the sparge curtain system on minimizing contaminant migration into the Chena River, (2) remediate the residual benzene contamination remaining in the WQFS source area above cleanup goals, and (3) evaluate natural attenuation and stability of the WQFS DRO plume.

5.9.4 Site Inspection

An inspection was conducted by USACE on August 11, 2015 to obtain familiarity with the site, review records, examine the remedial action area, and assess protectiveness of the remedy. The site was vegetated with forestation present along the Chena River. A boom was observed in the Chena River and portions of the former AS/SVE and AS curtain were observed, including the injection well banks and portions of the treatment system. FWA staff noted that the systems have been decommissioned and are not currently operating. Monitoring wells were locked and in good condition. No violations of the site-specific ICs were observed. Completed site inspection checklists are provided in Attachment 4 and site photographs are provided in Attachment 5.

FWA staff indicated that LUCs/ICs are maintained as required by the ROD.

The most recent IC review of the OU-5 Remedial Area is documented in the draft 2014 IC report (FES 2013h), which concluded:

- No evidence of unauthorized installation or use of groundwater wells.
- No soil disturbing activities were observed and vegetation is well maintained.

- Informational sign is intact but is showing signs of water damage.
- Wells at the site are easily assessable and are secured.
- Site land use has not changed.

The five-year review site inspection confirmed these conclusions.

5.9.5 Data Review

In 2009, soil sampling in the WQFS1 and WQFS2 treatment zone areas showed that the extent of DRO contamination in soil was similar to the extent identified in the RI and that the majority of the soil contamination was in the smear and saturated zones.

Monitoring activities at WQFS are currently focused on three objectives outlined in the Sparge Curtain PMP: to minimize migration of contaminants into the Chena River, to remediate residual benzene above the cleanup goal, and to evaluate natural attenuation and stability of the DRO plume. The latest findings, presented in the 2015 OU-5 Monitoring Report (FES 2016f), are discussed below and provided in Attachment 10. Well locations are shown on Figure 5-10.

In general, the sampling results from 2014 and 2015 showed water levels significantly higher (greater than 2 ft) than measured in previous years. This elevated groundwater condition was found across FWA and was caused by significant precipitation experienced in the spring and summer and warmer than usual spring temperatures. Changes in benzene, GRO, and DRO contaminant plumes resulting from treatment system operation and natural attenuation within the WQFS are illustrated in Attachment 10 (Figure 4-2).

<u>*Sparge Curtain Area*</u>

Groundwater samples were collected twice (May and August) in 2015 from nine wells in the Sparge Curtain monitoring program. Monitoring results showed the following:

- Two wells (AP-6946 and AP-7662) contained DRO above the cleanup goal in May 2015. An additional two wells (AP-10235 and AP-10220) detected DRO above the cleanup goal in August 2015. All four of these wells are outside the area excavated in 1998.
- No significant DRO contaminant rebound was observed in the sparge curtain area although persistent DRO contamination was identified in upgradient monitoring wells.
- Sheen was not identified on the purge water associated with wells along the Chena River and occurrence of sheen on the Chena River was intermittent.
- Sheen observations at individual stations along the boom (summarized in Table 3-6, *Chena River Sheen Observations (2012 through 2015)* in Attachment 10) depicts a decreasing trend in NAPL migration to the river.
- There were no observed exceedances of TAH or TAqH.

Natural attenuation parameters were monitored in the Sparge Curtain Area since the curtain was turned off in 2012. Conditions are generally reducing with DO concentrations below 2 mg/L in all wells except AP-10235MW, which was 2.8 mg/L. Groundwater geochemistry was assessed in the area of long-term exceedances of the cleanup level (AP-6946 and AP7662). Anaerobic biodegradation of hydrocarbons is likely occurring with iron, manganese, and/or sulfate reduction.

These results indicate that the contaminant plume is not migrating into the Chena River. According to the 2015 monitoring report for OU-5 (FES, 2016f), sheen has only been observed within the boom area and that the boom is effectively containing sheen releases. This five-year review recommends continued semi-annual groundwater sampling and boom deployment in 2016.

WQFS Source Area

Groundwater samples were collected and analyzed from 25 wells in the WQFS source areas in May 2015. The following results were obtained:

- Benzene concentrations were above the cleanup goal (5 µg/L) in six out of 10 wells in the WQFS benzene area and remained above 10 µg/L in three wells (AP-7455S, AP-10260, and OU5-TW2). Based on a long-term MAROS evaluation and short term trend analysis included in the 2015 monitoring report (see Attachment 10), the benzene Mann-Kendall trends were generally stable or decreasing and there is no evidence of benzene migration:
  - AP-7455S: stable (2007-2015)/stable (2011-2015)
  - AP-10260: Insufficient data available (2007-2015)/potentially decreasing (2011-2015)
  - OU5-TW2: no trend (2007-2015)/no trend (2011-2015)
  - OU5-TW6: no trend (2007-2015)/potentially increasing (2011-2015)
  - OU5-TW8: stable (2007-2015)/no trend (2011-2015)
  - OU5-TW10: no trend (2007-2015)/no trend (2011-2015)
- Benzene concentrations in upgradient monitoring well AP-8064 fluctuated just above the cleanup goal in 2015. The Mann-Kendall results for this well are potentially increasing (2007-2015) and no trend (2011-2015). An increasing trend in benzene concentrations was identified in one other well, AP-5974, located upgradient and across Front Street from the WQFS benzene area; however, the concentration of benzene at this location did not exceed the cleanup goal in 2015.
- The benzene dissolved mass exhibited no trend and decreased slightly between 2014 and 2015.
- DRO exceeded the cleanup goal in eight of 10 wells. The concentrations were lower than those measured in 2014 and the plume shows an overall decreasing trend. The results of a long-term MAROS evaluation were included in the 2015 monitoring report (see Attachment 10):
  - All sampling locations were stable, potentially decreasing, or exhibited no trend except for well AP-5975 located west of the former sparge curtain treatment system. DRO concentrations at this well fluctuated from 2,900 µg/L in 2011 to 3,500 µg/L in 2015.
- GRO concentrations continue to decrease and DRO concentrations remain stable in the WQFS benzene area based on both a dissolved contaminant mass trend and a location of the center of mass trend included in the 2015 monitoring report. The benzene and GRO centers of mass exhibited decreasing trends.
- The spread of the plumes around the center of mass trends showed a decreasing trend parallel and perpendicular to groundwater flow for DRO. The GRO and benzene plumes

showed decreasing trends parallel to groundwater flow and stable trends perpendicular to groundwater flow.

- Wells along the Chena River showed concentrations remaining stable for DRO and TAH.

Geochemical conditions in the vicinity of the DRO plume is largely reducing with DO concentrations less than 1 mg/L. Iron, manganese and sulfate concentrations indicate that reduction of these compounds is occurring. The most reduced conditions (highest dissolved iron and manganese, and lowest sulfate concentrations) were detected south of Gaffney Road within the former Horizontal Well and Source Area treatment areas.

The 2015 monitoring report for OU-5 (FES 2016f) recommended continued annual groundwater monitoring at the WQFS and removal of six wells (OU5-TW3, OU5-TW4, OU5-TW5, OU5-TW6, OU5-TW7, and OU5-TW9) from the monitoring program before the 2016 sampling event. These were temporary wells used for the ISCO treatability study and were not considered necessary for long-term monitoring.

5.9.6 Technical Assessment

5.9.6.1 Question A

Is the Remedy Functioning as Intended by the Decision Document?

Yes, the remedy is functioning as intended by the ROD.

The estimated timeframes to attain cleanup goals at the WQFS included the following:

- WQFS-1 Source Area (2 years) and Chena River (10 years)
- WQFS-2 Source Area (5 years) and Chena River (10 years)
- WQFS-3 Source Area (5 years) and Chena River (5-10 years)

Groundwater contaminant levels (DRO and benzene) remain above the cleanup goals and soil sampling data collected after active treatment indicates the presence of a smear zone that likely continues to contribute to groundwater contamination. Visual inspections of the Chena River identified an intermittent sheen on the water surface.

The RPMs recognized these unfulfilled ROD objectives and in 2012 and recommended the development of a Sparge Curtain PMP to provide a decision-making framework for interpretation of the results from site activities and to document the progress towards achieving remedial goals.

Despite their persistence, monitoring data have shown that the groundwater plumes are stable and significant rebound of groundwater contaminant concentrations has not been observed in the sparge curtain area. Furthermore, the occurrence of sheen in the Chena River has decreased and the boom minimizes contaminant migration.

LUC/ICs have been implemented and are functioning as intended.

Opportunities to improve the performance of ICs have been identified. The IC SOPs were intended to incorporate all information needed to understand the type of restrictions, location of restrictions, and maintenance/enforcement measures for all ICs required across all OUs/sites. Although ICs do not include engineering controls such as fences or caps, LUCs encompass both ICs and engineering controls. It is recommended that a the SOPs and accompanying documents needed to fully define the LUCs across the site, including types of controls, location of controls, specific responsibilities for LUCs including maintenance and enforcement be incorporated into one comprehensive living document.

Opportunities to reduce monitoring costs were not identified in this five-year review.

The following early indicator of a potential problem was identified for the WQFS: direct correlations between increases in stormwater infiltration and contaminant concentrations were identified.

5.9.6.2 Question B

Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Still Valid?

Yes, the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection for protection of human health are still valid. The current exposures and major exposure assumptions for future potential land use at the site have not changed. The toxicity criteria used to develop risk-based cleanup goals are reviewed in Attachment 8. That attachment also evaluates the potential for vapor intrusion at the site, since it was not previously evaluated. USEPA and ADEC guidance on vapor intrusion was either developed or significantly updated within the last five years.

There are no newly promulgated or modified requirements of federal and state environmental laws that change the protectiveness of the remedies implemented.

For protection of the environment (Chena River), the weight of evidence from sampling events performed in the past five years indicates that the RAOs remain protective. The lines of evidence include collection of additional sediment and surface water samples from the Chena River (both discrete and passive surface water sampling), pore water samples from wells placed on the shores of the river, groundwater samples from monitoring wells adjacent to the river, sheen observations along the river, observations of river stage and shoreline width, and the installation of a boom in the river. In 2015, levels of benzene in one of the monitoring wells along the Chena River (AP-10220) showed a potentially increasing trend relative to previous years. Note that benzene remains below the groundwater cleanup goal at this location. DRO is also intermittently detected at monitoring well AP-10220 above the cleanup goal. The concentration of DRO (documented as "stable" based on the 2015 data evaluation) has exceeded the cleanup level three times in the past five monitoring events.

The first exceedance of the DRO cleanup goal was identified in monitoring well AP-10235. The DRO concentrations remain below cleanup goals at wells located closer to the Chena River (AP-10221, AP-7727, AP-77289, and AP-7729). Further monitoring is required to accurately assess whether the increase at AP-10235 is due to groundwater elevation fluctuations or DRO plume migration.

Contaminant increases may be the result of fluctuating water elevations due to precipitation (most notably identified in 2014). There is also residual soil contamination present. The contaminant trends in these wells should be closely monitored in the future to ensure continued protection of the Chena River and to assess the proposed decommissioning of the AS curtain system.

5.9.6.3 Question C

Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No information has come to light that could call into question the protectiveness of the remedy for the intended use of the property as described in the ROD; however, the USEPA has identified 1,4-dioxane as an emerging contaminant.

An assessment has not been performed at the OU-5 WQFS to evaluate whether a release of the stabilizer 1,4-dioxane. A recommendation to perform sampling is included below; however, this issue is not anticipated to affect protectiveness based on the following information:

- LUCs/ICs have been implemented preventing receptors from direct contact with subsurface contaminants at the OU-5 WQFS.
- A hypothetical USEPA VISL was calculated for 1,4-dioxane (530,000 μg/L). This value is over four orders of magnitude greater than a VISL calculated for TCE under the same conditions (15 μg/L). ADEC does not have a VISL for 1,4-dioxane (VISL for TCE in groundwater is 5.2 μg/L). Based on this information, 1,4-dioxane should not pose a risk via vapor intrusion where no risk is identified for TCE.
- Groundwater contaminant concentrations at the OU-5 WQFS are relatively low.
- The closest drinking water supplies include:
    - The Golden Heart Utilities has four water supply wells (AK2310730 - community) located 3.1 miles from the OU-5 WQFS on the banks of the Chena River. These wells are unlikely to be influenced by the OU-5 WQFS due to the distance of separation, low contaminant concentrations, and groundwater flow direction.
    - The system operator was contacted on 27 October 2016 to request monitoring data for 1,4-dioxane as required for this system under the Unregulated Contaminant Monitoring Rule 3 (UCMR3). The operator indicated that the system was sampled for 1,4-dioxane twice in 2013 (February and August), however, the sampling point was at the entry point to the distribution system (post-treatment). The results indicate that no 1,4-dioxane was detected in the water samples at concentrations above the laboratory's minimum reporting limit of <0.07 μg/L. No raw water quality data was available for 1,4-dioxane.
    - Pioneer drinking water wells (AK2310714 - community) for the Hamilton Subdivision are located approximately 1.7 miles from the WQFS (see Figure 3-1). These wells are separated from the WQFS by a hydrogeologic divide (Chena River).
    - FWA has eight on-post wells (AK2310918 - community) and one well servicing the golf course (AK2311095 - non-community). In addition to those wells identified by the State, an emergency water supply well is located within the OU-2 DRMO Yard (see Section 5.3). The well locations are depicted on Figure 3-1. Only one well located on FWA is currently designated as a drinking water source (Building 3559 Water Well). This well is located approximately 1.1 miles southwest from the OU-5 WQFS. Based on the distance of separation and

groundwater flow direction at the WQFS, this well is unlikely to be influenced by the impacts at the WQFS.

- The OU-5 WQFS is located adjacent to the Chena River. Sediment and surface water studies were completed on the River to assess benthic macroinvertebrate toxicological studies and bioassays, and to monitor aquatic biotic integrity. No adverse impacts to the Chena River were identified from releases at the WQFS.
- No other sensitive receptors were identified.

5.9.6.4 Technical Assessment Summary

WQFS1

A source area AS/SVE system was installed in 1997 and expanded through 2001. It was shut down in 2005. A horizontal well AS/SVE system was installed in 1997 and expanded through 2001. It was shut down in 2005. Recent monitoring data indicates that DRO, GRO, and benzene exceeded their cleanup goals. The estimated timeframes to achieve cleanup goals in groundwater have passed. The benzene concentration trends are generally stable or decreasing, GRO concentrations are decreasing, and DRO concentrations remain stable. IC were implemented and are maintained as required in the ROD to prevent receptors from exposure to groundwater impacts. No changes in the ARARs or risk assessment were identified that would affect the protectiveness of the remedy.

WQFS2

A sparge curtain AS/SVE system was installed in 1998. The SVE portion of the system was shut down in 2004 and the AS system was operated until 2012. DRO and benzene have exceeded their cleanup goals; the estimated time frames have passed. Benzene trends are generally stable or decreasing, GRO concentrations are decreasing, and DRO concentrations are stable. IC were implemented and are maintained as required in the ROD to prevent receptors from exposure to groundwater impacts. No changes in the ARARs or risk assessment were identified that would affect the protectiveness of the remedy.

WQFS3

An AS/SVE system was installed in 2000 and shut down in 2003. All COCs have reached their cleanup goals. No changes in the ARARs or risk assessment were identified that would affect the protectiveness of the remedy.

5.9.7 Issues

The following issues were identified that may affect the future protectiveness of the OU-5 WQFS remedy:

- The historical decommissioning of infrastructure may have resulted in the abandonment of pipeline with impacts at the WQFS.
- An assessment for 1,4-dioxane has not been performed at the OU-5 WQFS.

The following concerns were identified that do not affect the protectiveness of the remedy:

- The Chena River boom was lifted off its supports in 2014 and rested along the riverbank due to a rise in the river level caused by heavy precipitation in the spring/summer.

Precautions should be taken to avoid this problem in the future (e.g., increase the height of the support posts).

- RRO, a COC, is not currently included in the groundwater monitoring program. Written justification for eliminating this parameter was not found by the five-year review.

The following site-wide concern was identified that does not affect the protectiveness of the FWA remedies:

- The site-wide SOP does not include documentation and information regarding all LUCs required throughout FWA.

5.9.8 Recommendations for Follow-up Actions

The following recommendations for follow-up actions were identified that may affect the future protectiveness of the OU-5 WQFS remedy:

- Conduct an investigation and determine if there are any previously undiscovered source areas at the WQFS.
- Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the OU-5 WQFS. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.

Recommendations for follow-up actions that do not affect protectiveness of the remedy are provided below:

- Implement measures to avoid future displacement of the Chena River Boom (e.g., increase height of the support posts).
- Provide justification on why RRO was dropped from the monitoring program.

The following site-wide recommendation was identified that does not affect the protectiveness of the FWA remedies:

- The U.S. Army should develop a revised site-wide IC program to include LUC/IC requirements. This will be initiated in November 2016 with a planned completion date of September 2018.

5.9.9 Protectiveness Statement

The remedy at OU-5 WQFS currently protects human health and the environment because:

- Initial remedial responses were performed and AS/SVE systems were installed and operated in accordance with the ROD. The treatment systems have recovered significant contaminant mass and reduced or prevented further migration of contaminated groundwater to downgradient areas and the Chena River.
- Natural attenuation is an active process that has reduced or prevented further migration of contaminated groundwater to downgradient areas and the Chena River.
- Occurrences of sheen in the Chena River have decreased.
- The Chena River Aquatic Assessment Program did not identify adverse impacts to benthic communities in the river.
- ICs are in place to ensure that groundwater containing contaminants above SDWA MCLs, non-zero MCLGs, or relevant AWQS (fresh water use criteria) will not be used until the cleanup goals are attained.

However, in order for the remedy to be protective in the long-term, the following actions need to be taken to ensure protectiveness:

- Conduct an investigation and determine if there are any previously undiscovered source areas at the WQFS.
- Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the OU-5 WQFS. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.

5.10 OU-5 East Quartermaster's Fueling System

5.10.1 Background Information

5.10.1.1 Physical Characteristics

The EQFS area covers approximately 40 acres between Taxiway 18 and the Chena River, and between Building 1579 to the southwest and Building 1054 to the northwest (Figures 2-1 and 5-11). The site is located within the 500-year floodplain of the Chena River. No endangered or threatened species reside in the area. Groundwater is located approximately 15 to 17 ft bgs.

5.10.1.2 Land and Resource Use

Current land use for EQFS is light industrial and groundwater use is considered residential because water supply wells for the City of Fairbanks are located in the same unconfined aquifer as groundwater contamination downgradient of the EQFS. The closest residences to EQFS are approximately ¼ mile northeast. Each residential area includes a school. Access to EQFS is unrestricted and the area is used for recreational purposes, which includes a bicycle trail. Access to the Chena River is unrestricted.

5.10.1.3 History of Contamination

The EQFS has been used for vehicle storage and maintenance, dry cleaning, fuels testing, refueling, pesticide storage and mixing, and waste storage (for example, polychlorinated biphenyls containing transformers, chemicals, paints, oils, brake fluid, and solvents). The EQFS included USTs, ASTs, a pump house, fueling islands, and an eight-inch diameter fuel pipeline that was abandoned but is still in place. Drains were connected to a wooden pipe that connected to the river. Solvents, pesticides, and petroleum contamination were found in groundwater beneath the site. Suspected sources include spills and leaks from pipelines, fueling stations and undocumented spills.

In 1989 and 1992, an investigation showed both petroleum and solvent contamination in the soil and groundwater. In 1994, a comprehensive evaluation of the EQFS was conducted, which included installing groundwater probes, soil borings, and monitoring wells (HLA 1996). The groundwater data identified several plumes (fuels and solvents). The soil data identified fuel and solvent contamination, which was believed to have originated from surface disposal and undocumented spills.

5.10.1.4 Initial Response

In June 1994, prior to the signing of the 1999 ROD, an AS/SVE treatability study was initiated at Building 1060 East. Results of the study showed that AS/AVE would be a viable remedial alternative. A natural attenuation treatability study, initiated in September 1997, showed a reduction in contaminant mass over time.

5.10.1.5 Basis for Taking Action

Based on the results of a baseline risk assessment that assumed industrial use of soil and residential use of groundwater, COCs for OU-5 EQFS were identified in the 1999 ROD. They are listed in Table 5-18.

Table 5-18 OU-5 EQFS COCs

Media	COC
Groundwater	RRO
	DRO
	1,2-DCA
	Toluene
	TCE
	1,2-EDB
	Bis(2-chlorethyl)ether
Soil	DRO
	GRO
	Xylenes
Chena River Surface Waters	TAH
	TAqH

5.10.2 Remedial Actions

5.10.2.1 Remedy Selection

RAOs established in the May 1999 ROD are discussed below.

Groundwater

- Restore groundwater to its beneficial uses within a reasonable time frame (defined as five years). Reduce or prevent further migration of contaminated groundwater from the source areas to the downgradient aquifer or surface water bodies that are closely hydrologically connected by achieving MCLs (where there are no nonzero MCLGs) and AWQS. For groundwater that is hydrologically connected to surface water, AWQS will apply for the following Fresh Water Uses: (l)(A) Water Supply; (l)(B) Water Recreation; and (l)(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife.
- Ensure there is no risk to aquatic receptors through control of contaminant movement through the groundwater into the Chena River.
- Remove LNAPL to the extent practicable to eliminate film or sheen from groundwater.
- Prevent use of groundwater containing contaminants at levels above SDWA MCLs, nonzero MCLGs, or the following AWQS for fresh water uses: (l)(A) Water Supply; (l)(B) Water Recreation; and (l)(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife.

Soil

- Prevent the migration to groundwater of soil contaminants that could result in groundwater contamination and exceedances of federal MCLs and nonzero MCLGs and to groundwater that is closely hydrogeologically connected to surface water (such as the Chena River) that could result in exceedances of AWQS in surface water (EQFS and WQFS).

Chena River Sediments

- Reduce sources of contaminant releases to the Chena River.

Chena River Surface Water

- Meet AWQS for the following fresh water uses: (1)(A) Water "J Supply; (1)(B) Water Recreation; and (1)(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife.
- Continue aquatic assessment.
- The selected remedy consisted of operating an AS/SVE system, ICs, and long-term monitoring and natural attenuation of groundwater COCs.

Cleanup goals identified in the ROD for COCs in groundwater, soil, surface water, and sediment are presented in Table 5-19.

Table 5-19 OU-5 EQFS COC Cleanup Goals

Media	COC or Parameter	ROD Cleanup Goal [1,2]
Groundwater	RRO	1,110 μg/L
	DRO	1,500 μg/L
	1,2-DCA	5 μg/L
	Toluene	1,000 μg/L
	TCE	5 μg/L
	1,2-EDB	0.05 μg/L
	Bis(2-chlorethyl)ether	0.0092 μg/L
	Floating-product petroleum hydrocarbons	Eliminate sheen
Soil	DRO	Active remediation of soils until contaminant levels in groundwater are consistently below state and federal MCLs
	GRO	
	Xylenes	
Chena River Surface Water	TAH	10 μg/L
	TAqH	15 μg/L
	Petroleum hydrocarbons	Eliminate sheen
	COCs identified in the Post-wide risk assessment	Benthic macroinvertebrates assessment to establish baseline and monitor aquatic biotic integrity over time
Chena River Sediments [3]	Contaminated sediments that contain all COCs identified in the post-wide risk assessment	No concentration of toxic substances or petroleum hydrocarbons and other contaminants in bottom sediments allowed that cause deleterious effects to aquatic life
		Benthic macroinvertebrates assessment to establish baseline and monitor aquatic biotic integrity over time[1]

Notes:

1 Groundwater and cleanup goals are maximum contaminant levels from the National and State Drinking Water Regulations (40 CFR 141.61 and 18 AAC 80) and 18 AAC 75 Table C.
2 Surface water cleanup goals are maximum contaminant levels from the Clean Water Act and 18 AAC 70.
3 The Chena River Aquatic Assessment Program was conducted to evaluate the impact from contamination on benthic communities. The results confirmed the presence of PAHs and petroleum hydrocarbon sheens but no adverse impact to benthic communities was identified. As a result, the program was discontinued. This decision is documented in the second Five-Year Review (US Army 2006).

5.10.2.2 Remedy Implementation

The AS/SVE system began operating as a treatability study on the east side of Building 1060 in 1994. It was shut down in September 2000, refurbished, and moved to the west side of Building 1060 where it operated from 2000 to 2005. It was decommissioned in 2010 when groundwater cleanup goals were achieved.

A natural attenuation treatability study was initiated in 1997; it showed a reduction in contaminant mass over time. Monitored natural attenuation was selected for deep groundwater and areas outside the active remediation system in EQFS. These included four areas known as Flowpaths A, B, C, and the Apple Street Hot Spot. Groundwater sampling in these areas was discontinued following the 2010 sampling event, with one exception; three monitoring wells associated with Flowpaths B and C were sampled in 2011 due to the identification of DRO contaminated soil in nearby Buildings 1565 and 1578. The 2011 sampling showed no exceedances of any COC cleanup goal and sampling was discontinued in these wells. The only wells in the EQFS that remain active for sampling are six wells known as the Flowpath D wells. They are currently sampled every five years.

The ROD required the U.S. Army to develop SOPs to identify all land areas under restriction, identify the objectives that must be met by the restrictions, and specify the particular restrictions, controls, and mechanisms to be used to achieve the identified objectives. The SOPs were intended to help assure that the ICs selected in this and other OU RODs were carried out and remain in place until the USEPA, ADEC, and the U.S. Army determine they are no longer needed to protect the public and the environment. The SOPs serve as a single site-wide source documenting all ICs being implemented at FWA. The OU-5 ROD also indicates that the SOPs will be a component of the five year review process.

ICs are maintained to ensure that groundwater will not be used until MCLs are attained. They include restrictions governing site access, construction, and water supply well installation as long as hazardous substances remain on site at levels that preclude unrestricted use. Signs have been installed to inform the public of restrictions and activities in this area.

Each OU is inspected annually and a complete summary of the survey and corrective actions taken are presented in an annual IC report. The first annual report was prepared for 2012 (FES 2013h) and prior IC inspection results were included in the OU-specific annual monitoring reports. IC inspections evaluate potential land use changes, site security (monitoring wells, etc., as applicable), or unauthorized groundwater use. In addition, reviews of the FWA IC GIS layer and the site-specific information in the ADEC Contaminated Sites database are conducted.

5.10.2.3 Operation, Maintenance and Monitoring

There are no active remediation systems operating at the EQFS and maintenance activities are limited to monitoring well inspections. The monitoring wells are inspected during sampling events to ensure that they are accessible, locked, and in good condition. Results of the inspections are presented in the monitoring reports. The wells are also inspected as part of the Installation-wide IC inspection. The last available report (2014) provided comments to replace or repair missing flush mount bolts, a cap, and damaged flush mount lids for three of the EQFS wells.

Groundwater monitoring is conducted every five years at six Flowpath D wells illustrated on Figure 5-11. The last sampling event took place in May 2015. Samples were analyzed for DRO and natural attenuation parameters (DO, ORP, manganese [dissolved], iron [dissolved], and sulfate). A seventh well (AP-7751) was decommissioned in 2012 because it obstructed a construction project. It was sampled prior to decommissioning and analyzed for GRO, DRO, benzene, toluene, TCE, 1,2-DCA, 1,2-EDB, and natural attenuation parameters.

Three wells (AP-6181, AP-7553, and AP-6193) were sampled in 2011 to evaluate potential groundwater contamination resulting from contaminated soil identified in 2010.

5.10.3 Progress Since the Last Five-Year Review

The Third Five-Year Review Report (U.S. Army 2011) provided the following protectiveness statement for OU-5:

> *"The remedy at OU5 currently protects human health and the environment because Institutional Controls are preventing exposure to, or ingestion of, contaminated groundwater. However in order for the remedy to remain protective for the long term, continued monitoring of the Remedial Area 1a fence will be conducted to ensure security and identify the need for repairs."*

Recommendations provided in the Third Five-Year Review Report and progress made to address them are identified below.

Recommendation: Discontinue groundwater sampling in Flowpath A, Flowpath B, Flowpath C, and the Apple Street Hot Spot wells and decommission the wells.

Progress: Sampling was discontinued at these locations following the 2010 sampling event; the wells should be decommissioned.

Recommendation: Continue groundwater sampling in specific wells associated with contamination found at Building 1565.

Progress: Three wells were sampled in 2011 and the data showed no exceedances of any COC. Sampling in these wells was discontinued and the wells should be decommissioned.

Recommendation: Continue groundwater sampling in Flowpath D on a five-year frequency.

Progress: Six of seven Flowpath D wells were sampled in 2015. Well AP-7751 was sampled in 2012 prior to decommissioning.

Recommendation: Implement IC measures that include: 1) performing a post-wide IC inspection and evaluating protectiveness, 2) updating restricted use boundaries in GIS as new information becomes available, 3) developing the parameters for an Annual Report of IC effectiveness and corrective actions taken, and 4) updating tables that describes in greater detail the ICs, the objectives to be met by the restrictions, and any specific restrictions, controls, and mechanisms.

Progress: These activities have been completed and are documented in annual IC reports prepared for 2012, 2013, and 2014 (FES 2013d, 2015a, 2015f).

5.10.4 Site Inspection

An inspection was conducted by USACE on August 11, 2015 to obtained familiarity with the site, review records, examine the remedial action area, and assess protectiveness of the remedy. The site was vegetated. No violations of the site-specific ICs were observed. Monitoring wells were locked and in good condition. Completed site inspection checklist forms are provided in Attachment 4 and site photographs are provided in Attachment 5.

FWA staff indicated that LUCs/ICs are maintained as required by the ROD.

The most recent IC review of the OU-5 Remedial Area is documented in the draft 2014 IC report (FES 2015f), which concluded:

- No evidence of unauthorized installation or use of groundwater wells was observed.
- No soil disturbing activities were observed and vegetation is well maintained.
- Wells at the site are easily assessable and are secured.
- Site land use has not changed.

The five-year review site inspection confirmed these conclusions.

5.10.5 Data Review

The 2015 analytical data for six wells sampled in Flowpath D (AP-7490, AP-7752, AP-7753, AP-7754, AP-7755, and AP-7823) showed DRO concentrations below the cleanup goal (Figure 5-1 in Appendix 10). Note that only DRO was sampled for in 2015 based on a decision made by the RPMs in the Winter 2015 FFA meeting. All other COCs were below cleanup goals after the treatment system was shut down. The 2012 results for well AP-7751 indicate that all ROD COCs analyzed were below the cleanup goals (RRO and bis(2-chlorethyl)ether were not analyzed).

Results of the previous sampling event in 2010 showed DRO exceeding the cleanup goal in AP-7755 (2,500 µg/L). Elevated DRO concentrations below the 1,500 µg/L cleanup goal were also identified in AP-7754 (1,400 µg/L) and AP-7753 (850 µg/L).

DRO concentrations were evaluated in the five-year review using the Mann-Kendall test to determine if any well shows a statistically significant upward or downward trend in concentration (Appendix 10). The results show a downward trend in wells AP-7490, AP-7751, AP-7752, AP-7753, and AP-7754. No trend is identified in wells AP-7755 and AP-7823.

The Chena River Aquatic Assessment Program documented that low concentrations of PAHs were present in sediments adjacent and downgradient of seep areas. With two exceptions, the toxicity to test organisms exposed to seep area sediments was comparable to test organisms exposed to reference area sediments (CH2M HILL 2002). A 2012 OU-5 monitoring report concluded that PAH detections in river sediment do not represent increased ecological risk (FES 2013e).

5.10.6 Technical Assessment

5.10.6.1 Question A

Is the Remedy Functioning as Intended by the Decision Document?

Yes, the remedy is functioning as intended by the ROD.

The AS/SVE system at Building 1060 was operated until MCLs were attained. Groundwater monitoring data has documented that natural attenuation is an active process that has reduced contaminant mass at the EQFS site. COC exceedances have not been observed in groundwater and sampling has been discontinued at the Flowpath A, Flowpath B, Flowpath C, and the Apple Street Hot Spot area. The sampling program now consists of six wells that are sampled every five years at Flowpath D. Recent groundwater monitoring results for DRO at this area were below the cleanup goal.

The estimated timeframe to achieve the cleanup goals was five years at the EQFS. An AS/SVE system operated as a treatability study prior to the ROD from 1994 to 1999 and continued after the ROD from 1999 to 2005 when it was shut down because the groundwater cleanup goals were achieved.

Contaminant source releases to the Chena River have been reduced. Monitoring of Chena River sediments has documented that low PAH concentrations do not represent an increased ecological risk.

Opportunities to improve the performance of ICs have been identified. The IC SOPs were intended to incorporate all information needed to understand the type of restrictions, location of restrictions, and maintenance/enforcement measures for all ICs required across all OUs/sites. Although ICs do not include engineering controls such as fences or caps, LUCs encompass both ICs and engineering controls. It is recommended that a the SOPs and accompanying documents needed to fully define the LUCs across the site, including types of controls, location of controls, and specific responsibilities for LUCs including maintenance and enforcement, be incorporated into one comprehensive living document.

Opportunities to reduce monitoring costs were not identified in the five-year review.

No early indicators of potential problems were identified.

5.10.6.2 Question B

Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Still Valid?

Yes, the exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy selection for protection of human health are still valid.

The groundwater cleanup goals for RRO, DRO, 1,2-DCA, toluene, TCE, and 1,2-EDB were MCL-based. There are no newly promulgated or modified requirements of federal and state environmental laws that would change the protectiveness of the remedies (Attachment 7).

The groundwater cleanup goal for bis(2-chloroethyl)ether was risk-based. The toxicity criteria for this compound has not changed, but the USEPA's current risk-based concentration is now slightly greater due to changes in risk assessment methods (Attachment 8).

For protection of the environment (Chena River), the weight of evidence from various sampling events performed in the last five years indicates that the cleanup goals and RAOs are still valid.

5.10.6.3 Question C

Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No information has come to light that could call into question the protectiveness of the remedy for the intended use of the property as described in the ROD; however, the USEPA has identified 1,4-dioxane as an emerging contaminant. A recommendation to perform sampling is included below; however, this issue is not anticipated to affect protectiveness based on the following information:

- LUCs/ICs have been implemented preventing receptors from direct contact with subsurface contaminants at the OU-5 EQFS.
- A hypothetical USEPA VISL was calculated for 1,4-dioxane (530,000 µg/L). This value is over four orders of magnitude greater than a VISL calculated for TCE under the same conditions (15 µg/L). ADEC does not have a VISL for 1,4-dioxane (VISL for TCE in groundwater is 5.2 µg/L). Based on this information, 1,4-dioxane should not pose a risk via vapor intrusion where no risk is identified for TCE.
- Groundwater contaminant concentrations at the OU-5 EQFS are relatively low.
- The closest drinking water supplies include:
    - The Golden Heart Utilities has four water supply wells (AK2310730 - community) located 3.3 miles from the OU-5 EQFS on the banks of the Chena River. These wells are unlikely to be influenced by the OU-5 EQFS due to the distance of separation, low contaminant concentrations, and groundwater flow direction.
    - The system operator was contacted on 27 October 2016 to request monitoring data for 1,4-dioxane as required for this system under the Unregulated Contaminant Monitoring Rule 3 (UCMR3). The operator indicated that the system was sampled for 1,4-dioxane twice in 2013 (February and August), however, the sampling point was at the entry point to the distribution system (post-treatment). The results indicate that no 1,4-dioxane was detected in the water samples at concentrations above the laboratory's minimum reporting limit of <0.07 µg/L. No raw water quality data was available for 1,4-dioxane.
    - Pioneer drinking water wells (AK2310714 - community) for the Hamilton Subdivision are located approximately 1.9 miles from the EQFS (see Figure 3-1). These wells are separated from the EQFS by a hydrogeologic divide (Chena River).
    - FWA has eight on-post wells (AK2310918 - community) and one well servicing the golf course (AK2311095 - non-community). In addition to those wells identified by the State, an emergency water supply well is located within the OU-2 DRMO Yard (see Section 5.3). The well locations are depicted on Figure 3-1. Only one well located on FWA is currently designated as a drinking water source (Building 3559 Water Well). This well is located approximately 1.2 miles southwest from the EQFS. Based on the distance of separation and direction of

groundwater flow, it is unlikely this well would be adversely impacted by the EQFS.

- The OU-5 EQFS is located adjacent to the Chena River. Sediment and surface water studies were completed on the River to assess benthic macroinvertebrate toxicological studies and bioassays, and to monitor aquatic biotic integrity. No adverse impacts to the Chena River were identified from releases at the WQFS.
- No other sensitive receptors were identified.

LUC/ICs have been implemented and maintained in accordance with the ROD. They have prevented the use of contaminated groundwater.

5.10.6.4 Technical Assessment Summary

An AS/SVE system was operated as a treatability study in 1994 prior to issuing the ROD in 1999. It was shut down in 2005 because the groundwater cleanup goals were achieved. All COC concentrations are below their cleanup goals. No changes in ARARs or the risk assessment were identified that would affect the protectiveness of the remedy.

5.10.7 Issues

The following issue was identified that may affect the future protectiveness of the OU-5 EQFS remedy:

- An assessment for 1,4-dioxane has not been performed at OU-5 EQFS.

The following site-wide concern was identified that does not affect the protectiveness of the FWA remedies:

- The site-wide SOP does not include documentation and information regarding all LUCs required throughout FWA.

5.10.8 Recommendations for Follow-up Actions

The following recommendation for follow-up actions was identified that may affect the future protectiveness of the OU-5 EQFS remedy:

- Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the OU-5 EQFS. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.

The following site-wide recommendation was identified that does not affect the protectiveness of the FWA remedies:

- The U.S. Army should develop a revised site-wide IC program to include LUC/IC requirements. This will be initiated in November 2016 with a planned completion date of September 2018.

5.10.9 Protectiveness Statement

The remedy at OU-5 EQFS currently protects human health and the environment because:

- Initial remedial responses were performed and an AS/SVE system was installed and operated in accordance with the ROD. The treatment system has reduced or prevented further migration of contaminated groundwater to downgradient areas and the Chena River.

- Natural attenuation is an active process that has reduced or prevented further migration of contaminated groundwater to downgradient areas and the Chena River.
- Occurrences of sheen in the Chena River have decreased based on sheen observations at individual stations along the boom documented in the 2015 monitoring report.
- The Chena River Aquatic River Assessment Program did not identify adverse impacts to benthic communities in the river.
- ICs are in place to ensure that groundwater containing contaminants above SDWA MCLs, non-zero MCLGs, or relevant AWQS (fresh water use criteria) will not be used until the cleanup goals are attained.

However, in order for the remedy to remain protective in the long-term, the following action needs to be taken to ensure protectiveness:

- Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the OU-5 EQFS. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.

5.11 OU-5 Remedial Area 1A Birch Hill Tank Farm ASTs

5.11.1 Background Information

OU-5 Remedial Area 1A is located on Birch Hill in the northwest corner of FWA (Figures 2-1 and 5-12). As part of the OU-3 ROD, the BHTF area was divided into two areas: Remedial Area 1A, which dealt with the petroleum and lead-contaminated soils surrounding the ASTs on Birch Hill; and Remedial Areas 1B, which dealt with groundwater contamination from the tanks, as well as several other sub-areas in the Birch Hill area. In order to provide more time to select appropriate cleanup goals and remedies for the lead-contaminated soils, Remedial Area 1A was transferred to OU-5.

The BHTF was constructed between 1943 and 1959 as a fuel storage facility. The facility included: fourteen 10,000-barrel and two 25,000-barrel ASTs and associated underground pipeline systems, pump houses, a manifold building, and a truck fill stand. Over the years, the ASTs contained arctic-grade diesel, jet fuel, and leaded and unleaded gasoline. The tanks were emptied and cleaned in 1993, and in January 1994 a closure letter was submitted to ADEC stating that all tanks, facility piping, and fuel handling appurtenances were purged of fuel, cleaned, and the piping was disconnected and flanged off from the tanks and filled with nitrogen. The ASTs were removed in 2015.

5.11.1.1 Physical Characteristics

Remedial Area 1A covers approximately 110 acres. The ground surface gently slopes southward and then westward at about 1.8 ft per mile. The BHTF was constructed on the southwest slope of Birch Hill, between elevations 530 ft and 725 ft, which are above the surrounding river plain and cantonment area that are approximately 450 ft in elevation.

The subsurface contains discontinuous permafrost and poorly drained soils covered by thick organic mats. Surface water ponding is common throughout the area during spring melt-off, after which mid-summer conditions dry the land surface. Wetlands are scattered throughout the area and shrub and forested wetlands border the southern portion. No endangered or threatened species reside in the area.

5.11.1.2 Land and Resource Use

The current land use is considered light industrial in the remedial area and light industrial, recreational, and residential in the surrounding areas. The groundwater below Remedial Area 1A is not currently a source of drinking water, although the Shannon Park Baptist Church and Steese Chapel on Lazelle Road are approximately ¼ mile west and have groundwater wells. Neither of these wells are currently used for drinking water. The U.S. Army currently fills a water holding tank at Shannon Park Baptist Church once a month. Bottled water was supplied to the Steese Chapel, which was discontinued at their request.

Fifty-two acres adjacent to the BHTF was sold in early 2006 for the Lazelle Estates residential housing development. The development included 220 lots, 91 of which were built by 2007. The development shares a property line with FWA, yet housing construction is concentrated along the Steese Highway that is approximately 1,000 ft from the Installation boundary. All of the housing units are on city water.

5.11.1.3 History of Contamination

RIs in this area found petroleum and lead hydrocarbons in surface and subsurface soils, with the most significant levels within bermed areas around the ASTs. The concentrations decreased with depth and distance from the tanks. Petroleum hydrocarbons (identified as Jet A fuel) were detected in surface and subsurface soil at a maximum concentration of 5,500 mg/kg. Low levels of other VOCs also were detected.

The source of the petroleum and lead contamination in soil at the BHTF is sludge from the bottom of the tanks, lead-containing thread lubricant used on bolt threads, and leaded paint chips from tank maintenance. A total of 16 borings were completed and 47 surface soil samples were collected during the RI. Lead was detected in all the samples, with a maximum concentration of 7,840 mg/kg. Figure 5-12 shows the locations of the tanks where samples were taken and where cleanup goals were exceeded. The highest concentrations were detected adjacent to the tanks, with lead concentrations decreasing with distance from the tanks.

In 2006, an investigation was conducted to estimate the volume of contaminated soil surrounding the ASTs. The estimated volume of contaminated soil (exceeding ADEC's industrial use 1,000 mg/kg industrial cleanup level) was 1,850 CY (2,800 tons). The highest concentrations of lead (14,500 mg/kg) were found directly adjacent to the ASTs in the upper 2 ft of soil.

5.11.1.4 Initial Response

No pre-ROD cleanup activities or response actions were performed at OU-5 Remedial Area 1A.

5.11.1.5 Basis for Taking Action

Based on the results of the baseline risk assessment that assumed industrial use of soil, lead was identified as a COC for Remedial Area 1A in the ROD. Petroleum contamination is also present.

5.11.2 Remedial Actions

5.11.2.1 Remedy Selection

The RAO for Remedial Area 1A is to limit human health and terrestrial receptor exposure to lead contaminated soil. The cleanup goal for lead contaminated soil is 1,000 mg/kg.

The selected remedy for Remedial Area 1A presented in the May 1999 ROD is ICs, which include land use and access restrictions, signage, and maintenance of the existing fence. The OU-5 ROD also stated that *"Soils containing petroleum and other contaminants will be cleaned up when the tanks are removed under the conditions of the Two-Party Agreement"*.

5.11.2.2 Remedy Implementation

Each OU is inspected annually and a complete summary of the survey and corrective actions taken are presented in an annual IC report. The first annual report was prepared in 2012 (FES 2013h). Prior to 2014, the results of IC inspections were included in the OU-specific annual monitoring reports. IC inspections evaluate potential land use changes, site security (monitoring wells, etc., as applicable), or unauthorized groundwater use. In addition, reviews of the FWA IC GIS layer and the site-specific information in the ADEC Contaminated Sites database are conducted.

5.11.2.3 Operation, Maintenance and Monitoring

There are no systems or wells associated with OU-5 Remedial Area 1A.

5.11.3 Progress Since the Last Five-Year Review

The Third Five-Year Review Report (U.S. Army 2011) provided the following protectiveness statement for OU-5:

> *"The remedy at OU5 currently protects human health and the environment because Institutional Controls are preventing exposure to, or ingestion of, contaminated groundwater. However in order for the remedy to remain protective for the long term, continued monitoring of the Remedial Area 1a fence will be conducted to ensure security and identify the need for repairs."*

The Third Five-Year Review Report recommended increased security in the BHTF area and repair of the BHTF fence, when required. Based on the information obtained from the 2014 IC Report, installation security was increased and fence repairs were made in a timely fashion.

In the summer of 2015, the BHTF ASTs were removed. Excavation of lead contaminated soil to 400 mg/kg was planned immediately following the AST removal but had to be postponed until spring 2016. Based on work plans submitted by the contractors, Marsh Creek LLC and Weston Solutions, Inc., up to 3,500 tons (2,000 tons plus an optional 1,500 tons) of contaminated soil will be excavated and disposed of offsite. Following excavation, confirmation samples will be collected from the bottom and sidewalls of each excavation and the excavation will be backfilled. A lead contaminated soil removal work plan was approved and the removal actions are planned for implementation in 2016.

The Third Five-Year Review Report also provided a requirement to implement IC measures that include: 1) performing a post-wide IC inspection and evaluating protectiveness, 2) updating restricted use boundaries in GIS as new information becomes available, 3) developing the parameters for an Annual Report of IC effectiveness and corrective actions taken, and 4) updating tables that describes in greater detail the ICs, the objectives to be met by the restrictions, and any specific restrictions, controls, and mechanisms. These activities have been completed and are documented in annual IC reports prepared for 2012, 2013, and 2014 (FES 2013d, 2015a, 2015f).

IC inspections of the OU-5 Remedial Area 1A fence were conducted monthly between February and December 2014. The inspections were conducted only along the western boundary (which is most prone to breaches) due to access limitations around the rest of the fence from snow in the winter. Several breaches to the security fence were observed during some of these inspections. FWA DPW was notified and repairs were made. Graffiti was also observed on the former tanks and fence signs.

5.11.4 Site Inspection

Remedial Area 1A was inspected by USACE on August 11, 2015 to examine the remediated areas and assess the protectiveness of the remedies. The site was forested and included staging areas for remedial activities occurring on 2-PTY sites and other construction activities. All wells appeared locked and in good condition. Fuel piping was observed in the area; FWA staff indicated that the piping is associated with the pipeline and not the tank farm.

Evidence of historical trespassing including fencing damage (repaired) and graffiti were observed onsite. Fencing repairs were completed. The information sign was in good condition. Site inspection checklists are provided in Attachment 4 and site photographs are provided in Attachment 5.

FWA staff indicated that LUCs/ICs are maintained as required by the ROD.

The IC review of the OU-5 Remedial Area documented in the draft 2014 IC report concluded the following:

- No evidence of unauthorized installation or use of groundwater wells was identified.
- No soil disturbing activities were observed and vegetation is well maintained.
- Informational sign is intact but is showing signs of water damage.
- Wells at the site are easily assessable and are secured.
- Site land use has not changed. The ASTs have been removed from the site.

The five-year review site inspection confirmed these conclusions.

5.11.5 Data Review

There is no data available for review because monitoring is not performed at Remedial Area 1A.

5.11.6 Technical Assessment

5.11.6.1 Question A

Is the Remedy Functioning as Intended by the Decision Document?

Yes the remedy is functioning as intended by the ROD. LUCs have been implemented and are limiting human and terrestrial receptor exposure to lead contaminated soil.

No early indicators of potential problems were identified.

5.11.6.2 Question B

Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Still Valid?

Yes, the exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy selection for protection of human health are still valid. The current exposures and major exposure assumptions for future potential land use at the site have not changed. The toxicity criteria used to develop risk-based cleanup goals are reviewed in Attachment 8.

Although the RBC for industrial exposure to lead in soil (identified as a to-be-considered criterion in the ROD) is now lower than it was at the time of the remedy, this does not affect protectiveness of the remedy since the current target for excavation of contaminated soil is the USEPA's RBC for protection of residential exposure. Remedial action is currently being planned to remove the contaminated soil from Remedial Area 1A (Marsh Creek and Weston 2015). The current plan is to remove all soils in excess of 400 mg/kg lead, which is the target level to protect human health in a residential setting (USEPA 2015b). The remedial action identified in the 1999 OU-5 ROD referred to a To-Be-Considered criterion of the USEPA's Region 9 Industrial Preliminary Remediation Goal (1,000 mg/kg lead) at the time of the ROD. The USEPA's current industrial RBC for soil lead is 800 mg/kg (USEPA 2015b). The lowering of the RBC to protect industrial exposure does not affect the protectiveness of the remedy at area 1A, since the decision was made to excavate all lead concentrations above 400 mg/kg, which is protective of residential use.

5.11.6.3 Question C

Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No other information has come to light that could call into question the protectiveness of the remedy for the intended use of the property as described in the ROD.

5.11.6.4 Technical Assessment Summary

The Remedial Area 1A remedy, ICs, was implemented and is maintained as required by the ROD. The ICs limit receptor exposure to lead-contaminated soil. No changes to the ARARs or risk assessment were identified that would affect the protectiveness of the remedy.

5.11.7 Issues

No issues were identified that affect protectiveness of the remedy at OU-5 Remedial Area 1A.

The following site-wide concern was identified that does not affect the protectiveness of the FWA remedies:

- The site-wide SOP does not include documentation and information regarding all LUCs required throughout FWA.

5.11.8 Recommendations for Follow-up Actions

There are no recommendations for follow-up actions at OU-5 Remedial Area 1A.

The following site-wide recommendation was identified that does not affect the protectiveness of the FWA remedies:

- The U.S. Army should develop a revised site-wide IC program to include LUC/IC requirements. This will be initiated in November 2016 with a planned completion date of September 2018.

5.11.9 Protectiveness Statement

The remedy at OU-5 Remedial Area 1A (BHTF ASTs) is protective of human health and the environment because:

- ICs are in place to limit human and terrestrial receptor exposure to contaminated soil
- There is no evidence of unauthorized installation or use of groundwater wells, no soil disturbing activities, and warning signs are intact.

5.12 OU-5 Open Burning/Open Detonation Area

5.12.1 Background Information

The OB/OD Area, formerly called the Explosives Ordnance Detonation Area, is within an active small-arms impact range on FWA. It is located approximately 1,000 ft north of the Tanana River and 1,500 ft south of a flood control dike. The exact boundaries of the OB/OD Area have not been well defined. The historically depicted extents of the OB/OD Area are provided on Figure 1-11, *OB/OD Area Site Plan*, in Attachment 11. It contains a berm that measures about 150 ft by 450 ft. The site was used by the U.S. Army from as early as the mid-1960s to as late as the mid-1980s for open burning/open detonation of unexploded ordnance and dud ordnance, unused propellants (black powder), rocket motors and small-arms ammunition.

The OB/OD Area was identified as a RCRA-regulated land-based unit in the 1991 FFCA that was signed by the U.S. Army and USEPA. Required corrective actions for the OB/OD area outlined in the 1991 FFCA and the 1992 FFA include the following actions: (1) submit a closure plan and post-closure plan with the interim status standards; and (2) integrate all RCRA corrective actions with any ongoing CERCLA response actions. The USEPA, ADEC, and U.S. Army decided to combine response actions under RCRA and CERCLA remedial action for the following reasons: the OB/OD Area is administratively subject to RCRA closure authority; the OB/OD Area is within the active firing range, which is subject to CERCLA authority; there were similar, but not identical, historical actions that took place at the OB/OD Area (destruction of explosives) and the range (use as a firing range with residuals of explosives remaining); and applying CERCLA authority concurrently with RCRA closure and corrective action requirements will minimize response costs as much as possible while remaining fully protective.

USEPA also determined that it was appropriate to allow final RCRA closure of the OB/OD Area concurrently with final clearance of the operating range, because the OB/OD Area is within the operating range and because it was anticipated that unexploded ordnance (UXO) would continue to be present at the operating range, RCRA closure prior to range closure would be technically complex, with little, if any, demonstrable environmental benefit. Therefore, USEPA approved the delay of closure of the OB/OD Area in accordance with 40 CFR 265.113(b)(l)(I). The OU-5 ROD was released pursuant to CERCLA and RCRA to record a no further action decision on remedial and corrective action and the decision to delay administrative closure of the regulated unit.

In accordance with the ROD and the RCRA permit, the U.S. Army is required to evaluate, no less often than the five-year reviews, whether delay of closure of the OB/OD area is no longer viable for one of the following reasons:

- The active range is no longer operating
- The post is being closed
- Any other reason

The ROD also states that *"The Army also will evaluate the status of RCRA rules and regulations for military munitions ranges and unexploded ordnance to determine whether additional RCRA requirements must be met."* The site is also subject to inspections to determine whether ICs to restrict land use and protect human health and the environment are sufficient.

5.12.1.1 Physical Characteristics

The OB/OD Area has not been used since the mid-1980s. It is situated within an active small-arms impact range on FWA. The physical location is approximately 1,000 ft north of the Tanana River and 1,500 ft south of a flood control dike. The site is located along the east side of a water-filled, gravel borrow pit and is bounded to the north and east by gravel berms. The bermed area comprising the OB/OD site measures approximately 150 ft by 450 ft. The soil within the OB/OD area is a permafrost silty clay. The OB/OD Area was cleared of trees and brush in early 2015 in order to prepare the area for a geophysical survey conducted to evaluate the location as a possible staging area in support of a Tanana River Burial Pit Removal Action (ERDC, CRREL 2015).

5.12.1.2 Land and Resource Use

The OB/OD Area is an active RCRA-regulated unit located within an operational range area known as the small-arms range impact range. The area is also part of a dud impact area. The reasonably anticipated future use of the land continues to be as an operational range. FWA has no plans to close the range. According to DoD policy, the OB/OD Area cannot be used for other purposes or transferred to the general public unless the unit is closed in accordance with the RCRA permit and clearance techniques ensure the area is sufficiently free of UXO and related hazards.

5.12.1.3 History of Contamination

The history of contamination presented below is based on referenced CERCLA and RCRA documents. The U.S. Army intends to perform a file review to garner additional history on the site. A schedule for the file review was not available at the time of the five-year review. The U.S. Army also intends to obtain more detailed site boundary information at the time of the RCRA closure. This work is postponed while the site functions as a portion of an active range.

The OB/OD Area was reportedly used for disposing of UXO and dud ordnance, unused propellants (black powder), rocket motors, small-arms ammunition, and other hazardous materials. A RCRA Facility Assessment (RFA) was conducted at the OB/OD Area in 1991. The RFA indicated that FWA EOD Detachment operated occasionally and detonated less than 4,000 pounds of waste ordnance each year. It noted that the maximum explosive charge used to detonate munitions was a 50-pound charge and was usually C-4. During the winter months, the charge was reduced to 25 pounds or less because of atmospheric conditions.

According to the 1996 RI, field representatives from the U.S. Army, USEPA, ADEC, and USACE accompanied by two ordnance experts, completed a site visit on September 1, 1994. With the assistance of the ordnance experts, this reconnaissance team identified appropriate sampling locations. Eight soil samples were collected at a depth of 3 to 6 inches bgs on the inside lip of two impact craters and from four areas where vegetation appeared stressed or sparse. Initially, samples were only going to be collected in detonation craters. However, during the field visit, the reconnaissance team agreed that the low vegetation areas also should be sampled. One water sample was collected from a detonation crater. This sample is considered representative of a groundwater sample, because the water level in the crater was reflective of groundwater elevation. The sampling strategy was designed to identify the worst-case contamination at the site. The 1994 sampling locations and results are depicted in Attachment 11, Figure 1-12, *OB/OD Area Chemical Concentrations in Soil and Water*. All samples were analyzed for halogenated VOCs, DRO, pesticides, PCBs, chemical agents, organosulfur compounds, explosives, explosives breakdown products, thioglycol, and chloroacetic acid.

An additional eight soil samples were collected from approximately the same locations for metals analyses from the OU-5 OB/OD Area during the OU-5 RI in 1996. Background samples were also collected from two locations 1,100 ft northwest of the OB/OD Area, which are depicted in Attachment 11, Figure 3-3, *OB/OD Area Surface Soil Sample Locations*. The soil samples were collected from 3 to 6 inches bgs. Details of these sampling events including sample locations and results are provided in the RI.

According to the OU-5 ROD, the sampling program for the OB/OD area was designed to identify any released contaminants from historical detonation activities. The primary sources of observed contaminants are explosive ordnance that was destroyed during the normal course of operation. Information about the potential hazardous wastes and hazardous waste constituents at the OB/OD Area was obtained primarily from the results from a 1994 surface soil sampling investigation conducted by the U.S. Army, and results from the 1996 OU-5 RI. Data tables from the RI have been extracted and included in Attachment 11 as Table 6-16, *Concentration Ranges and Detection Frequencies of Analytes Detected in Soil Samples from OB/OD Area* and Table 7-1, *Comparison of Metals Concentrations in Surface-Soil Samples at the OB/OD Area to Background Concentrations*.

No contaminants that exceed any ARARs were identified at the OB/OD Area. On the basis of the low levels of DRO and the organosulfur compound (Planevin) identified, no risk assessment was completed. The OB/OD Area is within an active range, where human access is extremely restrictive. The evaluation of the site indicated that there were no complete exposure pathways for contaminants and that the contaminants exist at such low levels that they are not of concern. The low contaminant levels were found to not pose an unacceptable risk to human health or the environment. Additionally, since the earliest site investigations in 1990, no munitions or munitions debris have been observed in the OB/OD Area. On the basis of the results of the RI/FS at the OB/OD Area and an evaluation of data collected at the site, no further action was selected for the OB/OD Area. Because of concerns about potential human exposure to UXO, it was noted that ICs to monitor and control access and to restrict land use would apply to the OB/OD Area.

There is no evidence that the OB/OD Area was used to store or bury munitions or munitions debris.

5.12.1.4 Initial Response

No pre-ROD cleanup activities or response actions were performed at OB/OD Area.

5.12.1.5 Basis for Taking Action

The OB/OD area was a RCRA regulated unit subject to closure requirements. It was located within an operational range that may have been contaminated by munitions constituents and potential UXO associated with intended use as a range. Therefore, closure was delayed. A component of the decision to delay closure was the ICs associated with the operational range, which restricted use and access.

5.12.2 Remedial Actions

The OU-5 ROD states that *"…no further action is selected for the former OB/OD area for hazardous chemicals. Because of concerns about potential human exposure to unexploded ordnance, the Army has institutional controls that provide monitoring and control of access of the site. These controls are required to remain in place. No analysis of remedial alternatives was conducted for the OB/OD area."* Although no remedial actions were required to address hazardous chemicals at the OB/OD area, the ROD requires that no less often than during the CERCLA five-year reviews, the U.S. Army will evaluate the OB/OD area. This evaluation would include review of the active range and any UXO within the OB/OD area and range to determine whether ICs to restrict land use and protect human health and the environment are sufficient. The U.S. Army would also evaluate the status of RCRA rules and regulations for military munitions ranges and UXO to determine whether additional RCRA requirements must be met.

The U.S. Army implemented ICs at the OB/OD Area in 1999. Figure 5-13 in Attachment 1 depicts the boundaries of the ICs.

5.12.3 Progress Since the Last Five-Year Review

The third five-year review for FWA evaluated whether delay of closure affected the OB/OD Area. It determined that delay of closure did not affect the OB/OD Area because the range had not been closed and FWA continued to be an active installation. Therefore, it was concluded that continued delay of closure of the site was appropriate.

5.12.4 Site Inspection

A road has been hardened to provide access for a removal action in an area where buried munitions and munitions debris were discovered adjacent to the Tanana River, approximately 1000 ft from the OB/OD Area. A locked gate controls vehicular access to the road, which runs adjacent to the OB/OD Area. The Tanana River site is not part of the OB/OD Area and is undergoing a removal action for munitions and munitions debris buried at the site.

The OB/OD Area primarily consists of dense tree and brush growth. It contains an approximate 2 acre area that was cleared in 2015 for a geophysical survey. The surrounding area is wooded. A lake created from a gravel borrow area, is west of the site. Nothing beyond the clearance of trees demarcates it as being different than other areas of the operational range.

5.12.5 Data Review

After review of the OU-5 ROD, RCRA Permit and attached Interim Closure Plan, no information has been received to suggest that no action is no longer protective of human health and the environment. A *Safety Clearance Survey to Support the Evaluation of the Proposed Staging Area for the Tanana River Burial Pit Removal Action Summary Report* (ERDC, CRREL 2015) was also reviewed. Based on the Safety Clearance Report, a visual and geophysical survey was conducted in the OB/OD Area to determine whether the area was suitable as a staging area and did not evaluate protectiveness of the remedy. According to the Safety Clearance Report, no UXO or discarded military munitions were discovered in the area surveyed, and based on the electromagnetic survey, it was concluded that the area is considered safe for use as a staging area for future removal actions at the Tanana River site.

Trespassers were discovered on the nearby Tanana River site in June 2013. The U.S. Army notified the USEPA of the following enhancements to the ICs at the OB/OD Area as a result of this discovery (U.S. Army 2016):

- Patrols conducted by range control personnel have been increased to weekly.
- Additional signage has been placed along the perimeter of the impact area that includes the Tanana River site and OU-5 OB/OD Area to warn people both of the potential explosives hazards associated with the impact area and that the impact area access is restricted.
- Periodic inspections of the signs is performed.
- A temporary access road was constructed to provide access for the removal of the Tanana River burial site and a staging area near OU-5 OB/OD. A gate has been installed to prohibit entry to the road leading to the Tanana River site and OU-5 OB/OD Area.
- Daily inspections of the temporary access road and flood control dike are required when the operational range is in use. The operational range is normally active Monday through Friday each week.

The access road will be removed once the removal action at the Tanana River site is completed. The patrols and periodic inspections will continue to be conducted by range personnel and environmental staff, respectively.

The U.S. Army plans to perform a file review to collect additional information on the OU-5 OB/OD Area to present a thorough narrative of site history and use.

5.12.6 Current Status of the Site

A technical assessment was not performed for the OU-5 OB/OD area since no further action was selected for the former OB/OD area for hazardous chemicals.

Based on ICs in place for the operational range that limit land use and access, it is appropriate that closure of the OB/OD Area under RCRA continue to be deferred. Although, trespassers accessed an area of the operational range known as the Tanana River burial site, there is no evidence that trespassers have accessed the OB/OD area. The Tanana River burial site and the OB/OD Area are distinct and dissimilar sites. The Tanana River burial site is adjacent to the Tanana River, which can be used by the public. Because of the eroding river bank, brass munitions from the Tanana River burial site could be seen from the river. The OB/OD Area is not adjacent to publicly accessible water bodies or roads, and nothing demarcates the unit as being different than the rest of the operational range area. Additionally, the OB/OD Area was used for open burn and open detonation activities and has been found to pose no unacceptable risk. The ICs required for the OB/OD Area are a result of the regulated unit being located within an operational range, which is and will continue to be subject to the deposition of intended use munitions that may pose an explosive hazard. After the discovery of the Tanana River burial site, FWA Range Control reviewed the range controls that are in place. Signs warning of hazards and prohibiting access were inspected and added, patrols were increased, a gate was added, and Range Control is updating its Range Control Standard Operating Procedures to ensure that these measures remain in place.

The U.S. Army has evaluated whether delay of closure affects the OB/OD Area and has determined it does not. No UXO have been discovered and the OB/OD Area has not been disturbed. Additionally, no new RCRA or munitions' rules have been promulgated in the last five years that would change the unregulated status of intended use munitions or UXO on the operational range. An ARAR evaluation has been completed as required in the RCRA permit and is included in Attachment 7.

The range has not been closed and will continue to be used as operational range into the reasonably anticipated future. Additionally, if UXO is discovered during patrols, the UXO will be addressed in accordance with normal range clearance procedures. The area continues to be subject to deposition of munitions and munitions constituents, making closure technically complex and with little if any demonstrable environmental benefit. Therefore, the current ICs are sufficient to protect human health and the environment, and the delay of closure of the OU-5 OB/OD unit continues to be appropriate.

The U.S. Army is currently drafting a SOP for inspection of the OB/OD Area. Current activities include inspection of the site gate every day that live-fire exercises are conducted, and weekly routine inspections. No detailed documentation of these activities is prepared; however, the SOP will require specific inspection of the OB/OD Area for site use and activities. Any issues identified during inspections must be reported to the DPW Environmental staff.

5.12.7 Issues

No issues were identified affecting the protectiveness of the OU-5 OB/OD area or delayed closure under the RCRA permit.

The following site-wide concern was identified that does not affect the protectiveness of the FWA remedies:

- The site-wide SOP does not include documentation and information regarding all LUCs required throughout FWA.

5.12.8 Recommendations for Follow-Up Actions

No recommendations for follow-up actions were identified affecting the protectiveness of the OU-5 OB/OD area or delayed closure under the RCRA permit.

The following site-wide recommendation was identified that does not affect the protectiveness of the FWA remedies:

- The U.S. Army should develop a revised site-wide IC program to include LUC/IC requirements. The development process will be initiated in November 2016 with a planned completion date of September 2018.

5.12.9 Protectiveness Statement

A remedy has not been selected for the OU-5 OB/OD Area. The following statement was developed to meet the requirements for an assessment of delayed RCRA closure and UXO ICs:

No further action with UXO ICs and delayed RCRA closure of the OU-5 OB/OD area is protective of human health and the environment.

This statement is supported by the following:

- The OB/OD IC components have been improved since trespassers were identified on a site located 1,000 ft from the OB/OD Area. Improvements include increased frequency of inspection and access controls.

- There is no evidence of unauthorized installation or use of groundwater wells or evidence of soil disturbing activities, and warning sites are intact at the OB/OD Area.

5.13 OU-6 Former Communications Site

5.13.1 Background Information

OU-6, Former Communications Site, is situated on FWA between Alder and Neely Roads, east of White Street and west of the FWA Central Heat and Power Plant (Figure 2-1). OU-6 previously contained or was used for barracks, company headquarters, communications and radar systems, salvage/reclamation yard activities, debris disposal, firefighter training, and possible ammunition storage. Much of what is known about OU-6 has been inferred from historical photographs from 1947 to present, the 1958 FWA "Master Plans", past geographical surveys, and military operations with similar missions conducted at other locations.

The Former Communications Site was selected for construction of military housing, referred to as the Tanana Trails Family Housing Development (formerly known as Taku Gardens Family Housing Development), in 2002 and 2003. Work began in mid-2005 with the installation of foundations and underground utilities for 65 planned residential buildings and two mechanical buildings. Construction activities for the housing development lead to the discovery of buried debris and munitions-related items and environmental contamination in soil and groundwater at the site.

5.13.1.1 Physical Characteristics

OU-6 is approximately 54 acres. Housing units (55 structures) and related infrastructure have been constructed on the site. Current site conditions are shown on Figure 5-14.

Soil beneath the site generally consists of sandy silt near the surface that changes to sand and sand with silt and gravel at approximately 8 to 10 ft bgs. Permafrost and low subsurface temperatures have only been reported in the southeastern portion of the site (CH2M HILL 2010c).

OU-6 is located within the Chena River floodplain. Surface water is channeled through engineered drainage swales in west and northwest sections of the site. The Chena River is located approximately 1,500 ft north of the site.

Groundwater occurs in Chena Formation sediments at approximately 13.5 to 23 ft bgs. Unconfined conditions are present in permafrost-free areas. Groundwater generally flows northwest, consistent with regional flow in the Tanana Basin alluvial aquifer. The Chena Formation has relatively high hydraulic conductivity, estimated at up to 1,400 ft per day. The vertical hydraulic conductivity is estimated at 30 ft per day (U.S. Army 2015).

5.13.1.2 Land and Resource Use

The Former Communication Site was selected for development in 2003/2004, and construction of 64 original military housing units began in April 2005. Occupancy of the housing development was prohibited by an action memorandum issued in 2007 (U.S. Army 2007). This requirement, along with perimeter fencing, were rescinded by the OU-6 ROD (U.S. Army 2016). Housing units at OU-6 are now occupied by military families stationed at FWA (U.S. Army 2015).

Groundwater is the only potable water source for FWA and the Fairbanks area. Approximately 95 percent of the potable water on FWA is supplied by two large capacity wells located in Building 3559, which is outside the northeast corner of OU-6. The wells were installed to a depth of approximately 100 ft bgs and screened from 60 to 80 ft bgs. They provide approximately 1.6 to 2.4 million gallons of water per day.

5.13.1.3 History of Contamination

Previous site activities included the dumping of solid waste and debris into a former meander channel of the Chena River (Hoppe's Slough). Unusable military equipment and hardware discarded by the U.S. Army and U.S. Air Force was also buried onsite. Aerial photographs taken between 1948 and 1967 show drum stockpiles, fire training burn areas, and the remains of a wrecked aircraft. A Post Exchange Service Station (gas station) and a salvage yard were located in the northeast section of the site.

The Former Communication Site was selected for future military housing in 2002/2003 (OASIS 2007). Site investigations conducted prior to construction of the housing development identified surface and buried materials that consisted of metal and munitions debris. U.S. Army munitions experts determined that the munitions debris did not contain any explosive hazards. PCB soil contamination was detected. Site investigations ensued, which are summarized below (OASIS 2007).

- **October 2003** - Soil borings installed and sampled during a geophysical and geotechnical survey performed by USACE, Alaska District and the U.S. Army Cold Regions Research and Engineering Laboratory (CRREL) documented the presence of metal debris at the Former Communication Site.
- **November 2003-November 2004** - Pre-construction soil boring sample results collected during the USACE geotechnical/chemical surveys indicated low-level PCB compounds in two soil borings. Metal debris was encountered in some of the geotechnical soil borings.
- **April 2004** - Site clearing activities were performed and uncovered extensive amounts of scrap metal, drums, and discarded military Munitions and Explosives of Concern (MEC) in the north section of the source area.
- **May 2004** - R&M Consultants, Inc. conducted a geophysical survey for housing construction. The survey documented subsurface metallic debris at several locations.
- **March and April 2005** - A follow-up limited characterization was performed and did not confirm the presence of PCBs previously detected in two soil borings.
- **June 2005** – Petroleum contamination was discovered in the northwest corner of the Former Communication Site (in the area of Building 5 through 9) during housing construction. Soil and groundwater samples were collected and confirmed fuel contamination.
- **Late June 2005** – High levels of PCBs and associated chlorinated solvents were detected in the original Building 52 foundation. A construction site clearance for PCBs identified high levels of chlorinated contamination in the surface and subsurface soil. Ongoing construction activities were using or moving the potentially contaminated soil at the construction site.
- **August 2005** – Investigations were initiated to ensure protectiveness of workers and nearby residents. Stockpiled soil, trenches, and traffic areas were kept wet to minimize dust and air transport of contamination from the site. In addition to soil sampling, the investigation included collection and testing of wipe samples from adjacent residences

west of the Former Communication Site and construction equipment left on-site when the U.S. Army suspended construction activities, and shallow groundwater testing. On-site field screening of Aroclor 1260 supplemented the off-site analytical testing.

- **2005-2006** – Preliminary source evaluations were conducted to provide sufficient information to determine if a RI was required. An initial phase evaluation consisted of reviewing historical information about site activities, waste disposal practices, and prior investigations. A second phase evaluation focused on characterizing buried debris, soil, soil gas, stockpiles, and groundwater at the site.
- **2007 to 2010 -** RI data established the nature and extent of contamination at the site. Modelling of drinking water supply wells adjacent to the northeast corner of the site (Building 3559) suggested that the hydraulic capture zone associated with a pumping rate of 1,700 gallons per minute would extend to a limited portion of the site where contaminated groundwater had historically exceeded ADEC cleanup levels.

The extent of soil and groundwater contamination identified at OU-6 is illustrated on figures provided in Attachment 12.

Five areas of concern (AOCs) (also referred to as source areas) were identified through the review of historical documents and investigation results at the Former Communication Site. The AOCs are depicted in Attachment 12 on an OASIS figure, *Source Areas,* and labeled as figure Appendix C. The AOCs are described as follows:

- **Subarea A**: Formerly a fenced storage area used from the early 1940s to late 1960s. Stored materials may have included salvaged parts and drums. Additional uses include a concrete batch plant, company headquarters, barracks, and railroad tracks. A large stained area was identified where fire training activities may have occurred. Airplane debris was also observed on historical aerial photographs.
- **Subarea B**: This area was formerly developed with temporary buildings for company headquarters and barracks. DRO was detected in groundwater and soil associated with fuel storage for military activities in the 1950s.
- **Subarea C**: Former location of company headquarters and barracks. Buried metal debris and odors were encountered during excavations in this area. The metal debris was removed by construction activities.
- **Subarea D**: This area was used for salvage activities beginning in the 1940s. Other activities include munition, live ammunition, transformer, and drum storage.
- **Subarea E**: This area was formerly the location of communication and radar systems. The area may have also been used for the storage of live ammunition, weapons, and rockets.

5.13.1.4 Initial Response

The U.S. Army performed several response actions prior to the ROD. These are described below and illustrated on figures provided in Attachment 12.

- **Time-critical removal action (2005)**: Soil/debris was removed from the site coincident with characterization activities. A chain-link security fence was erected around an exclusion zone on the site and an 8-ft high permanent chain-link fence with three-stranded barbed wire was installed around the perimeter of the entire site. Warning signs were placed every 100 ft on the chain-link fence.

- **Preliminary source evaluations (2005 to 2006)**: Petroleum contaminated soil was excavated and transported to an off-site thermal treatment facility in Fairbanks, Alaska. The treated soil was disposed of at the FWA solid waste landfill. Non-hazardous metallic debris was segregated from soil and disposed of at the FWA solid waste landfill.
- **Interim LUCS (2007)**: Interim LUCs are described in a 2007 Action Memorandum (U.S. Army 2007), which documented the time-critical removal action and established interim LUCs for the site that would remain in place until permanent LUCs were established in a ROD. The interim LUCs consisted of:
    - Prohibiting residential use and occupancy of newly constructed housing units until all investigation and cleanup required under CERCLA to protect human health and the environment was complete and regulator coordination had been undertaken.
    - Maintaining fencing and warning signs around the perimeter of the site to restrict access.
    - Groundwater use restrictions prohibiting the drilling and use of water wells for potable water, fire suppression, irrigation or other consumptive purposes.
    - Prohibiting soil disturbing activities associated with construction or renovation of new or existing facilities to include residential and commercial construction, road repair and realignment, utility work, digging, trenching, excavation, paving, or drilling of soil borings except when such activities were carried out in accordance with an Excavation Clearance Request approved by the U.S. Army in consultation with USEPA and ADEC. In cases of emergency, standard reporting requirements and practices would be followed.
- **RI-related removal activities (2007 to 2010)**:
    - PCB-contaminated soil was excavated, characterized, and properly disposed.
    - Petroleum- and pesticide-contaminated soil was excavated, characterized, and properly disposed.
    - Mostly crushed and empty drums and non-hazardous munitions-related items were excavated and properly disposed or recycled. Contaminated soil was excavated, characterized, and properly disposed.
    - Drums and grease-affected soil from beneath Building 49 were removed.
    - Construction-generated soil was properly disposed.
- **Post RI time-critical removal action (2010 - 2011)**:
    - Contaminated soil from three excavations (north of Building 11, east of Building 48, and south of Building 24) was properly disposed.
    - DRO-contaminated soil from a drainage swale excavation was removed and disposed.
    - Metal debris, overpacks of expended charcoal filters, and potentially chromium-contaminated soil associated with charcoal filters found in the vicinity of Building 27 were removed and properly disposed.

- o DRO, TCE, and benzene-contaminated soil from a drainage swale excavation north of Building 38 was removed and properly disposed.
- o Contaminated soil near Building 42 (western side of the site) was excavated and properly disposed.

The total amount of waste removed during these actions is summarized below (U.S. Army 2012, 2014).

- 3,368 CY of PCB contaminated soil
- 66 CY of pesticide contaminated soil
- 3,354 CY of petroleum/solvent contaminated soil
- 2,934 items classified as munitions related debris
- 1,061 drums, all but eight of which were empty and crushed

5.13.1.5 Basis for Taking Action

Environmental investigations conducted prior to and during the RI identified contaminated soil and groundwater (U.S. Army 2014).

Soil

Debris, drums, munitions-related items, and contaminated soil encountered during investigation activities and removal actions were removed to the greatest extent practicable and properly disposed of. Soil contaminated with POL and residual concentrations of 1,2,3-TCP, VOCs, SVOCS, pesticides, herbicides, and explosive compounds remained in the subsurface between 5 and 15 ft bgs.

Groundwater

Groundwater at OU-6 is contaminated with POL and VOCs. Presumed source areas were removed to the greatest extent practicable. Five groundwater plumes are present:

- A TCE plume
- A TCP plume
- A main DRO plume
- DRO plumes associated with monitoring wells MW62 and MW77

Site COCs were documented in the ROD (U.S. Army 2014) and are listed in Table 5-20.

Table 5-20 OU-6 Former Communications Site COCs

Media	COC
Soil	1,2,3-TCP
	DRO
	Aluminum
	Copper
	Manganese
Groundwater	1,2,3-TCP
	TCE
	DRO
	RRO

5.13.2 Remedial Actions

5.13.2.1 Remedy Selection

RAOs established in the January 2014 ROD (U.S. Army 2014) are listed below.

Soil

- Protect against human exposure to COCs in soil. This RAO will be achieved if soil containing COCs at concentrations exceeding PCLs is managed through administrative processes, or if COCs in soil are reduced to meet the cleanup goals.

Groundwater

- Protect against human exposure to COCs in groundwater. This RAO will be attained if the exposure pathway to human receptors is limited or eliminated through administrative processes, or if COC concentrations in groundwater are reduced to meet the cleanup goals.
- Return groundwater to its beneficial use as a drinking water source. VOCs are expected to reach the cleanup goals within 25 years; it is expected that remediation of DRO and RRO will take longer. This RAO will be achieved when groundwater COCs are below the cleanup goals.

The cleanup goals for COCs in soil and groundwater are presented in Table 5-21.

Table 5-21 OU-6 Former Communications Site Soil and Groundwater COC Cleanup Goals

COC	Cleanup Goal	Basis
Soils		
1,2,3-TCP	0.17 mg/kg	1
DRO	10,250 mg/kg	2
Aluminum	77,000 mg/kg	3
Copper	4,160 mg/kg	2
Manganese	1,800 mg/kg	3
Groundwater		
1,2,3-TCP	0.12 µg/L	4
TCE	5 µg/L	5
DRO	1,500 µg/L	4
RRO	1,100 µg/L	4

Notes:

1 ADEC inhalation risk-based cleanup level
2 ADEC direct contact risk-based cleanup level
3 USEPA risk-based screening level
4 ADEC Table C cleanup level
5 Federal and state drinking water MCL

The selected remedy consists of (U.S. Army 2014, U.S. Army 2015):

- ICs prohibiting any soil disturbing activity greater than 6 inches bgs without FWA DPW-approved Work Request, a U.S. Army-, USEPA-, and ADEC-approved Environmental Work Plan, and a FWA DPW-approved Excavation Clearance Request. In cases of an emergency, standard reporting requirements described in the Excavation Clearance Request will be followed. This includes the following possible activities: residential and commercial construction, road repair and realignment, trenching, excavation, paving, and drilling soil borings for the purpose of monitoring well installation.

- ICs prohibiting the use of or access to groundwater beneath OU-6. This includes:
  - Prohibiting drinking and other domestic uses, fire suppression, irrigation, or other consumptive purposes.
  - Prohibiting the installation of dewatering wells, monitoring wells, irrigation, fire suppression, or potable water wells without prior approval from the U.S. Army via an approved Work Request, a U.S. Army-, USEPA-, and ADEC- approved Environmental Work Plan, and an approved Excavation Clearance Request.
- ICs prohibiting damage or defacement of a monitoring well.
- Groundwater sampling to monitor the progress of natural attenuation processes and to ensure that contamination is not migrating toward FWA drinking water supply wells located outside the northeast corner of the site.
- Disposal and transport of soil or groundwater from OU-6 must meet standards for container type, sampling and analysis for potential contamination, marking and labeling, and moving and storage requirements specified in U.S. Army Regulations. Soil or groundwater from OU-6 will not be removed without permission from an authorized U.S. Army representative and concurrence from the USEPA and ADEC. The U.S. Army shall notify the USEPA and ADEC of any proposed waste disposal/treatment facility that will be receiving soil or groundwater from the site.

5.13.2.2 Remedy Implementation

ICs were implemented when the final Remedial Design/Remedial Action Work Plan for OU-6 (U.S. Army 2015) was issued (May 2015). Groundwater monitoring data collected as of this five-year review has not been performed under an approved work plan and has not been accepted by USEPA.

5.13.2.3 Maintenance and Monitoring

Maintenance and monitoring activities at OU-6 are described below (U.S. Army 2015).

IC Inspections and Maintenance

IC inspections are conducted annually and consist of:

- Reviewing records for compliance with dig permits and deviations
- Observing site conditions and noting any LUC inconsistencies
- Inspecting the monitoring wells

Routine activities involve maintaining the ICs and monitoring well network integrity. The OU-6 Institutional Control Implementation and Assurance Plan, included as an appendix to the OU-6 Remedial Design/Remedial Action Work Plan (U.S. Army 2015), identifies details required to maintain the integrity of the remedy and ensure that it remains protective of human health and the environment.

Results of the IC inspection and maintenance activities are documented in an Annual Institutional Controls Report for Operable Unit 6. Site inspections were conducted in September and October 2015. The inspections determined that ICs were implemented. No unauthorized activities were observed and only minor corrective measures were required to address deficiencies.

- Unauthorized access to soil below six inches was not observed
- Unauthorized installation of water wells was not observed
- Unauthorized use of groundwater beneath OU-6 was not observed
- Minor corrective actions were completed, including replacing locks in three monitoring wells (MW-20, -51, and -90)

Groundwater Monitoring

Groundwater monitoring will be performed to track COC concentrations and water quality parameters to assess the progress of natural attenuation until the COCs meet the groundwater cleanup goals and groundwater is acceptable for unrestricted use and unlimited exposure (U.S. Army 2015). Samples will be collected biannually or at a frequency agreed upon by the U.S. Army, USEPA, and ADEC. Table 5-22 identifies groundwater monitoring requirements. Well locations are shown on Figure 5-14.

Table 5-22 OU-6 Former Communications Site Groundwater Monitoring Requirements

Well	Parameters			
	DRO/RRO [1]	VOCs [2]	Low-level VOCs [3]	MNA Parameters [4,5]
MW-03	X			X
MW-06A	X			X
MW-08			X	
MW-12R	X			X
MW-13			X	X
MW-28	X		X	X
MW-32R	X		X	X
MW-33	X		X	X
MW-35	X		X	X
MW-37	X		X	X
MW-38	X		X	X
MW-39			X	X
MW-47			X	X
MW-48	X			X
MW-58	X			X
MW-61		X	X	X
MW-62	X	X	X	X
MW-64	X			X
MW-77	X			X
MW-78			X	X
MW-79			X	X
MW-80			X	X
MW-82				
MW-91			X	

Table 5-22 OU-6 Former Communications Site Groundwater Monitoring Requirements

Well	Parameters			
	DRO/RRO [1]	VOCs [2]	Low-level VOCs [3]	MNA Parameters [4,5]
MW-93			X	

Notes:

1 DRO by Method AK102/RRO by Method AK 103
2 SW846 Method 8260
3 SW846 Method 8260 SIM
4 MNA parameters: ferrous iron, dissolved potassium, dissolved manganese. Sulfate, alkalinity, nitrogen as NO_2/NO_3, ammonia, phosphorous, and methane
5 Ferrous iron by field test kit

The U.S. Army will follow the USEPA guidance document, *Recommended Approach for Evaluating Completion of Groundwater Restoration Remedial Actions at a Groundwater Monitoring Well (USEPA 2014c)* to determine when RAOs have been met. Before removing any well from the monitoring network, an appropriate statistical method approved by the USEPA and ADEC will be used to determine when the 95-percent upper confidence limit or equal is at or below the cleanup goal.

The groundwater monitoring program has not been implemented since the USEPA- and ADEC-approved Remedial Design/Remedial Action Work Plan.

5.13.3 Progress Since the Last Five-Year Review

This is the first five-year review of the OU-6 Former Communications Site.

5.13.4 Site Inspection

A site inspection was conducted by USACE on August 11, 2015 to obtain familiarity with the site, review records, examine the remedial action area, and assess protectiveness of the remedy. The site contains new military housing and related infrastructure (i.e. roads and utilities). The perimeter fence that was installed as an interim LUC was not present. FWA staff indicated that vapor mitigation systems had been installed in the housing units. The systems are not required by the ROD; they were proactively installed by the U.S. Army to address any potential VOC vapor intrusion issues. Some of the housing units were occupied.

5.13.5 Data Review

There is no routine monitoring and maintenance data to review associated with the OU-6 selected remedy since the USEPA- and ADEC-approved Remedial Design/Remedial Action Work Plan.

Although not included as part of the remedy selected in the 2014 ROD, investigations were performed in OU-6 to assess the site for emerging contaminants perfluorinated compounds (PFCs). The OU-6 area was specifically assessed for perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) associated with the historical use of aqueous firefighting foams. Potential former fire training areas were identified in historical records. Soil samples were collected in October 2013. Soil sample locations and results are depicted in Attachment 12, Figure 4-2, *PFOS and PFOA Concentrations in FTP-3B Soil* Samples. The results of the soil sampling are also summarized on Table A-4, *Subsurface Soil Sample Results* in Attachment 12.

The soil data was compared to proposed ADEC rule 18 AAC 75 and EPA Region 4 Residential Soil Screening Levels. No exceedances of these screening levels were identified.

Groundwater samples were collected in November 2013 and June 2015. The groundwater sample locations and results are depicted in Attachment 12, Figure 4-4, *PFOA and PFOS Concentrations in FTP-3B Groundwater Samples*. The results are also tabulated in Attachment 12, Table A-6, *2015 Groundwater Sample Results*. The results are compared to proposed ADEC rule 19 AAC 75 and EPA Provisional Health Advisory Levels. Exceedances of these values were identified in two sampling locations in November 2013:

- AP-10276MW, PFOA detected at 0.44 µg/L, exceeds both the proposed ADEC rule (PFOA, 0.401 µg/L) and USEPA Provisional Health Advisory Level (PFOA, 0.40 µg/L) This well is located in Subarea E.
- AP-10278MW, PFOS detected at 0.75 µg/L, (exceeds both the proposed ADEC rule (PFOS, 0.601 µg/L) and the USEPA Provisional Health Advisory Level (PFOS, 0.20 µg/L)). This well is located in Subarea A. Data validation identified this result as estimated due to matrix interference.
- AP-6148, PFOS detected at 0.2 µg/L, exceeds the USEPA Provisional Health Advisory Level (PFOS, 0.20 µg/L).

  This well is located in the southern portion of Subarea A.

Repeat sampling from these locations in June 2015 identified the following results:

- AP-10276MW, PFOA detected at 0.33 µg/L (below screening levels).
- AP-10278MW, PFOS detected at 0.75 µg/L (exceeds both the proposed ADEC rule (PFOS, 0.601 µg/L) and the EPA Provisional Health Advisory Level (PFOS, 0.20 µg/L)).
- AP-6148, PFOS detected at 2.0 µg/L (exceeds both the proposed ADEC rule (PFOS, 0.601 µg/L) and the EPA Provisional Health Advisory Level (PFOS, 0.20 µg/L)).

No other exceedances of the screening levels were identified in November 2013 or June 2015.

5.13.6 Technical Assessment

5.13.6.1 <u>Question A</u>

Is the Remedy Functioning as Intended by the Decision Document?

Yes, the remedy is functioning as intended by the ROD.

LUCs have been implemented to protect against human exposure to COCs in soil. The inspection conducted in October and November 2015 determined that no unauthorized activities were observed and only minor corrective measures were required at three monitoring wells (new locks installed).

Groundwater monitoring results used to track COC concentrations and assess the progress of natural attenuation have not been accepted by the USEPA and ADEC.

No opportunities for optimization and no early indicators of potential issues were identified by the five-year review.

No early indicators of potential problems were identified.

5.13.6.2 Question B

Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Still Valid?

Yes, the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection at OU-6 remain valid. The site is now being used for residential use. Residential exposure was assessed during the RI and identified as an anticipated land use at the time of the ROD. No changes to toxicity criteria for risk-based cleanup goals identified in the ROD for soil and groundwater, or vapor intrusion screening levels used in the VI monitoring reports have occurred.

There are no newly promulgated or modified requirements of federal and state environmental laws that would change the protectiveness of the soil or groundwater remedies implemented in OU-6.

5.13.6.3 Question C

Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No other information has come to light that would call into question the protectiveness of the remedy.

5.13.6.4 Technical Assessment Summary

The OU-6 remedy, ICs, have been implemented and are maintained as required by the ROD to prevent receptors from exposure to impacted groundwater. Groundwater monitoring in accordance with the ROD will begin in 2016. Elevated concentrations of PFOA and PFOS were detected in groundwater monitoring samples collected in 2013 and 2015 to assess PFCs as emerging contaminants. This data will be reviewed with the USEPA to determine whether additional sampling/remedial actions are necessary to address these groundwater impacts. Since ICs remain in place at OU-6, this data does not affect the protectiveness of the remedy at OU-6. No changes to ARARs or the risk assessment were identified that would affect the protectiveness of the remedy.

5.13.7 Issues

No issues were identified that affect protectiveness of the remedy.

The following site-wide concern was identified that does not affect the protectiveness of the FWA remedies:

- The site-wide SOP does not include documentation and information regarding all LUCs required throughout FWA.

5.13.8 Recommendations for Follow-up Actions

There are no recommendations for follow-up actions at the OU-6 Former Communications Site.

The following site-wide recommendation was identified that does not affect the protectiveness of the FWA remedies:

- The U.S. Army should develop a revised site-wide IC program to include LUC/IC requirements. It will be initiated in November 2016 with a planned completion date of September 2018.

5.13.9 Protectiveness Statement

The remedy at OU-6 is protective of human health and the environment because:

- ICs are in-place to ensure that human exposure to contaminated soil and groundwater will not occur.
- There is no evidence of unauthorized installation or use of groundwater wells.
- Groundwater quality data will be used to assess the performance of the OU-6 remedy in the future.

6.0 SUMMARY

6.1 Recommendations for Follow-up actions

Table 6-1 provides recommendations to address current issues that affect protectiveness at FWA sites subject to this five-year review.

Table 6-1 Recommendations for Issues That Affect Protectiveness at FWA

Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Yes or No)	
					Current	Future
OU-1 801 Drum Burial Site						
Under agreement among the RPMs, data was not collected from monitoring wells located between currently monitored points and the 801 Military Housing Area for inclusion in the five-year review. Data from these wells was not available for use in the vapor intrusion assessment at OU-1.	Collect groundwater samples from monitoring wells AP-6326, AP-6327, AP-7162, and AP-10042 for analysis for VOCs and complete a vapor intrusion assessment.	FWA	USEPA	September 2018	No	Yes
An assessment for 1,4-dioxane has not been performed at monitoring well AP-6326	Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the 801 Drum Burial Site. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.	FWA	USEPA	September 2018	No	Yes
OU-2 Building 1168 Leach Well and DRMO Yard						
An assessment for 1,4-dioxane has not been performed at the Building 1168 Leach Well site and DRMO Yard.	Perform sampling to evaluate whether a release pf 1,4-dioxane has occurred at the Building 1168 Leach Well and DRMO sites. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.	FWA	USEPA	September 2018	No	Yes

Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Yes or No)	
					Current	Future
OU-3 Remedial Area 1B (BHTF - GW), Remedial Area 2 (Valve Pits and ROLF), and Remedial Area 3 (FEP Mileposts 2.7 and 3.0)						
The inhalation pathway should not have been eliminated during development of the TMB cleanup goals in the OU-3 ESD. The 1994 baseline risk assessment clearly considered residential inhalation of VOCs from tap water to be a complete exposure pathway, which was quantified in characterizing the baseline risk from exposure to site contaminants.	Re-establish the cleanup goals for 1,2,4-TMB and 1,3,5-TMB in groundwater using either of the following methods: 1) update the RBCs by including the inhalation pathway and using the 2016 USEPA IRIS toxicity assessment, or 2) adopt the cleanup goals established in 18 AAC 75.	FWA	USEPA	September 2018	No	Yes
OU-3 Remedial Area 1B (BHTF - GW)						
The benzene and 1,2-DCA concentrations continue to exceed cleanup goals and exhibit increasing trends in some monitoring locations.	Perform a data gap investigation and recommend a future course of action for Remedial Area 1B.	FWA	USEPA	September 2018	No	Yes
OU-3 Remedial Area 2 (Valve Pits and ROLF)						
The historical decommissioning of infrastructure may have resulted in the abandonment of pipeline with impacts at Remedial Area 2.	Conduct an investigation and determine if there are any previously undiscovered source areas at Remedial Area 2.	FWA	USEPA	September 2018	No	Yes

Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Yes or No)	
					Current	Future
OU-3 Remedial Area 3 (FEP Mileposts 2.7 and 3.0)						
The concentrations of benzene remain high and exhibit increasing trends in several wells. Analysis has shown that groundwater cleanup goals will not be achieved for these areas within a reasonable period of time.	Perform a data gap investigation and recommend a future course of action for the milepost sites (This activity is currently under contract with the U.S. Army).	FWA	USEPA	September 2018	No	Yes
OU-4 Landfill						
An assessment for 1,4-dioxane has not been performed at the Landfill.	Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the Landfill. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.	FWA	USEPA	September 2018	No	Yes
OU-5 WQFS						
The historical decommissioning of infrastructure may have resulted in the abandonment of pipeline with impacts at the WQFS.	Conduct an investigation and determine if there are any previously undiscovered source areas at the WQFS.	FWA	USEPA	September 2018	No	Yes
OU-5 EQFS						
An assessment for 1,4-dioxane has not been performed at OU-5 WQFS or EQFS.	Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the OU-5 WQFS or EQFS. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.	FWA	USEPA	September 2018	No	Yes

Table 6-2 provides recommendations to address concerns that do not affect protectiveness at FWA sites subject to this five-year review.

Table 6-2 Recommendations for Concerns That Do Not Affect Protectiveness at FWA

Concern	Recommendations/ Follow-up Actions	Party Responsible
Site-Wide		
The site-wide SOP does not include documentation and information regarding all LUCs required throughout FWA.	The U.S. Army will develop a revised site-wide IC program to include LUC/IC requirements. The development process will be initiated in November 2016 with a planned completion date of September 2018.	FWA
OU-1 801 (Drum Burial Site)		
The reporting limit for dieldrin in groundwater in 2015 exceeded the cleanup goal.	Provide greater scrutiny of groundwater analytical limits during future monitoring events.	FWA
Insufficient groundwater quality data is available to determining attainment of cleanup levels at monitoring wells AP-10042 and AP-7163.	Increase monitoring frequency in these wells from once every five years to biennial (2017 and 2019) until the next five-year review.	FWA
OU-2 (Building 1168 Leach Well)		
All cleanup goals identified in the OU-2 ROD have been attained, although petroleum contamination persists at the site.	An iRACR should be completed to document remedial action complete under CERCLA.	FWA
OU-2 (DRMO Yard)		
The OU-2 ROD prohibits the refilling of the DRMO Yard fire suppression water tank from the existing DRMO Yard potable water supply until state and federal MCLs are met within the contaminant plume. The potable well was used in the past to fill the fire suppression water tank and is tested routinely to confirm that the water meets state and federal MCLs.	The U.S. Army will restrict future use of the DRMO Yard potable water supply in accordance with the ROD.	FWA
Frost-jacked monitoring points were observed on site at the time of the site inspection in the OU-2 DRMO Yard.	Frost-jacked points should be evaluated for repair or replacement in the OU-2 DRMO Yard.	FWA

Table 6-2 Recommendations for Concerns That Do Not Affect Protectiveness at FWA

Concern	Recommendations/ Follow-up Actions	Party Responsible
OU-3 Remedial Area 1B (BHTF)		
All COCs have attenuated to below the cleanup goals in the alluvial aquifer near Building 1173, in the alluvial and bedrock aquifers near the Truck Fill Stand, and in the alluvial and bedrock aquifers at the Thaw Channel Area.	Groundwater monitoring should be reevaluated after remedial work under the 2-Party Agreement is completed (petroleum and other contaminant removal). The well inventory should be incorporated, where appropriate, into the attenuation monitoring program for the bedrock aquifer at Birch Hill. An optimized alluvium and bedrock well array should be selected to monitor the attenuation of recalcitrant COCs so a remedy completion strategy can be defined. The MAROS sampling periodicity analysis presented in the 2015 monitoring report should continue to be used as a basis for other potential changes to the groundwater sampling program.	FWA
OU-3 Remedial Area 2(Valve Pits and ROLF)		
An ISCO injection treatability study was conducted at Valve Pit A	Continue to evaluate whether ISCO injections or excavation of contaminated soil at Valve Pit A would enhance natural attenuation in groundwater	FWA
OU-4 Coal Storage Yard		
The remedial action has attained all RAOs and groundwater cleanup goals (for residential use) identified in the OU-4 ROD. The site meets unlimited use and unrestricted exposure criteria identified in the ROD.	An iRACR should be completed to document remedial action completion under CERCLA. If the site retains IC restrictions, the five-year review must be conducted to evaluate that component of the remedy.	FWA
OU-5 (WQFS)		
In 2014 the Chena River boom was lifted off its supports and rested along the riverbank due to a rise in the river level caused by heavy precipitation in the spring/summer that year.	Implement measures to avoid future displacement of the Chena River Boom (e.g., increase height of the support posts).	FWA
RRO was apparently dropped from the monitoring program but no written justification was found	Provide justification on why RRO was dropped from the monitoring program.	FWA

6.2 Protectiveness Statements

OU-1

The remedy at OU-1 is protective of human health and the environment because:

- Contaminant source removal (drums and contaminated soil) was completed.
- Migration of COCs in groundwater to the Chena River and downgradient drinking water wells is not occurring based on sampling results that indicate the plume is stable.
- Based on groundwater data and a comparison of groundwater quality to the calculated USEPA VISLs, the vapor intrusion exposure pathway is incomplete at the 801 Drum Burial Site.
- ICs are in place to ensure that groundwater will not be used until cleanup goals are attained and to assure that exposure to any contaminated soil at the site will not occur.

However, in order for the remedy to be protective in the long-term, the following actions need to be taken to ensure protectiveness:

- Collect groundwater samples from monitoring wells AP-6326, AP-6327, AP-7162, and AP-10042 for analysis for VOCs and complete a vapor intrusion assessment.
- Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the 801 Drum Burial Site. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.

OU-2

The remedies at OU-2 currently protect human health and the environment because:

- All cleanup goals have been attained at the Building 1168 Leach Well site, although petroleum contamination persists at the site.
- Migration of COCs in groundwater from the DRMO-1 and DRMO-4 source areas has been reduced by the remedial actions.
- ICs are in place to ensure that groundwater containing COCs will not be used.

However, in order for the remedies to be protective in the long-term, the following action needs to be taken to ensure protectiveness:

- Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the Building 1168 Leach Well site and DRMO Yard. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.

OU-3

The remedies at OU-3 currently protect human health and the environment because:

- Further migration of contaminated groundwater has been reduced by the remedial actions and natural attenuation.
- There are no complete pathways for human exposure to groundwater. ICs are in place to ensure that groundwater containing COCs will not be used.
- Off-post risks associated with the consumption of contaminated groundwater at Remedial Area 1B are mitigated by attenuation of COCs in the alluvial aquifer.

However, in order for the remedies to be protective in the long-term, the following action needs to be taken:

- Re-establish the cleanup goals for 1,2,4-TMB and 1,3,5-TMB in groundwater using either of the following methods: 1) update the RBCs by including the inhalation pathway and using information from a new USEPA IRIS toxicity assessment that was under development during drafting of this report and just released as final on September 9, 2016, or 2) adopt the cleanup goals established in 18 AAC 75.
- Perform a data gap investigation at Remedial Area 1B and the FEP Mileposts 2.7 and 3.0 sites and recommend a future course of action for the sites. (This activity is currently under contract with the U.S. Army for the Milepost sites).
- Conduct an investigation to evaluate if there are any previously undiscovered source areas at the Remedial Area 2 (Valve Pits and ROLF).

OU-4

The remedies at OU-4 currently protect human health and the environment because:

- All RAOs have been attained at the Coal Storage Yard.
- Further migration of contaminated groundwater from the Landfill Source Area has been reduced by the implemented remedy and natural attenuation.
- ICs are in place at the Landfill Source Area to ensure that contaminated groundwater will not be used until the cleanup goals are attained.

However, in order for the remedies to be protective in the future, the following action needs to be taken to ensure protectiveness:

- Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the Landfill. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.

OU-5

The remedies at OU-5 currently protect human health and the environment because:

- Initial remedial responses were performed at WQFS/EQFS and AS/SVE systems were installed and operated in accordance with the ROD. The treatment systems have recovered significant mass and reduced or prevented further migration of contaminated groundwater to downgradient areas and the Chena River.
- Natural attenuation is an active process that has reduced or prevented further migration of contaminated groundwater to downgradient areas and the Chena River from the WQFS/EQFS.
- The Chena River Aquatic Assessment Program did not identify adverse impacts associated with the WQFS/EQFS to benthic communities in the river.
- Occurrences of sheen in the Chena River have decreased.
- ICs are in place at the WQFS/EQFS to ensure that groundwater containing contaminants above SDWA MCLs, non-zero MCLGs, or relevant AWQS (fresh water use criteria) will not be used until the cleanup goals are attained.

- ICs are in place at Remedial Area 1A to limit human and terrestrial receptor exposure to lead contaminated soil.
- The OB/OD IC components have been improved since trespassers were identified on a site located 1,000 ft from the OB/OD. Improvements include increased frequency of inspections and access controls.
- There is no evidence of unauthorized installation or use of groundwater wells or evidence of soil disturbing activities, and warning signs are intact at Remedial Area 1A and the OB/OD area.

However, in order for the remedies to be protective in the future, the following action needs to be taken to ensure protectiveness:

- Conduct an investigation and determine if there are any previously undiscovered source areas at the WQFS.
- Perform sampling to evaluate whether a release of 1,4-dioxane has occurred at the OU-5 WQFS or EQFS. If present, evaluate whether 1,4-dioxane poses an unacceptable risk to human health and the environment.

OU-6

The remedy at OU-6 is protective of human health and the environment because:

- ICs are in-place to ensure that human exposure to contaminated soil and groundwater will not occur.
- There is no evidence of unauthorized installation or use of groundwater wells.
- Groundwater quality data will be used to assess the performance of the OU-6 remedy in the future.

6.3 Next Review

The next review for FWA will be conducted by September 2021.

ATTACHMENT 1

Figures

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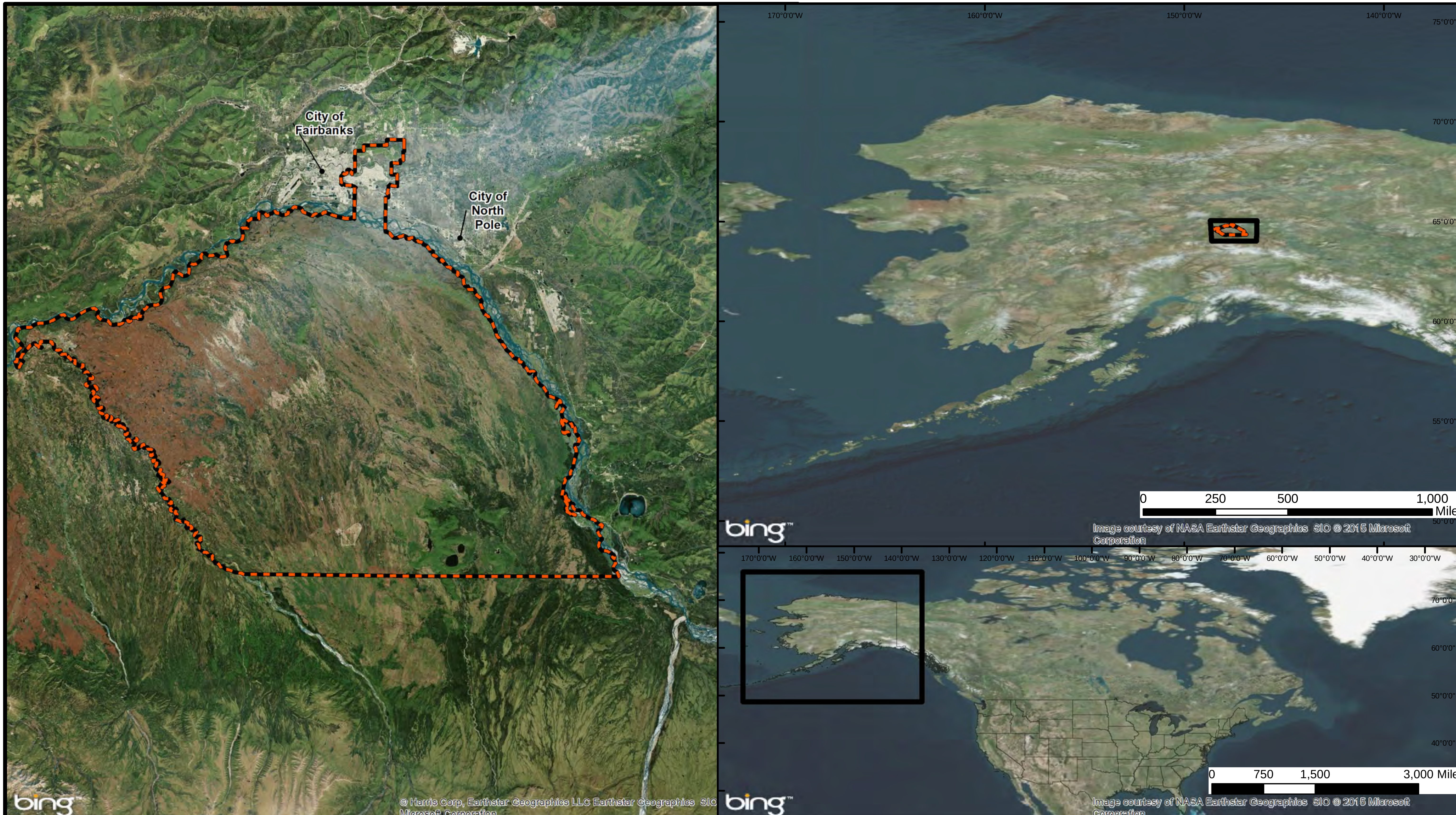


Installation Boundary

N W E S

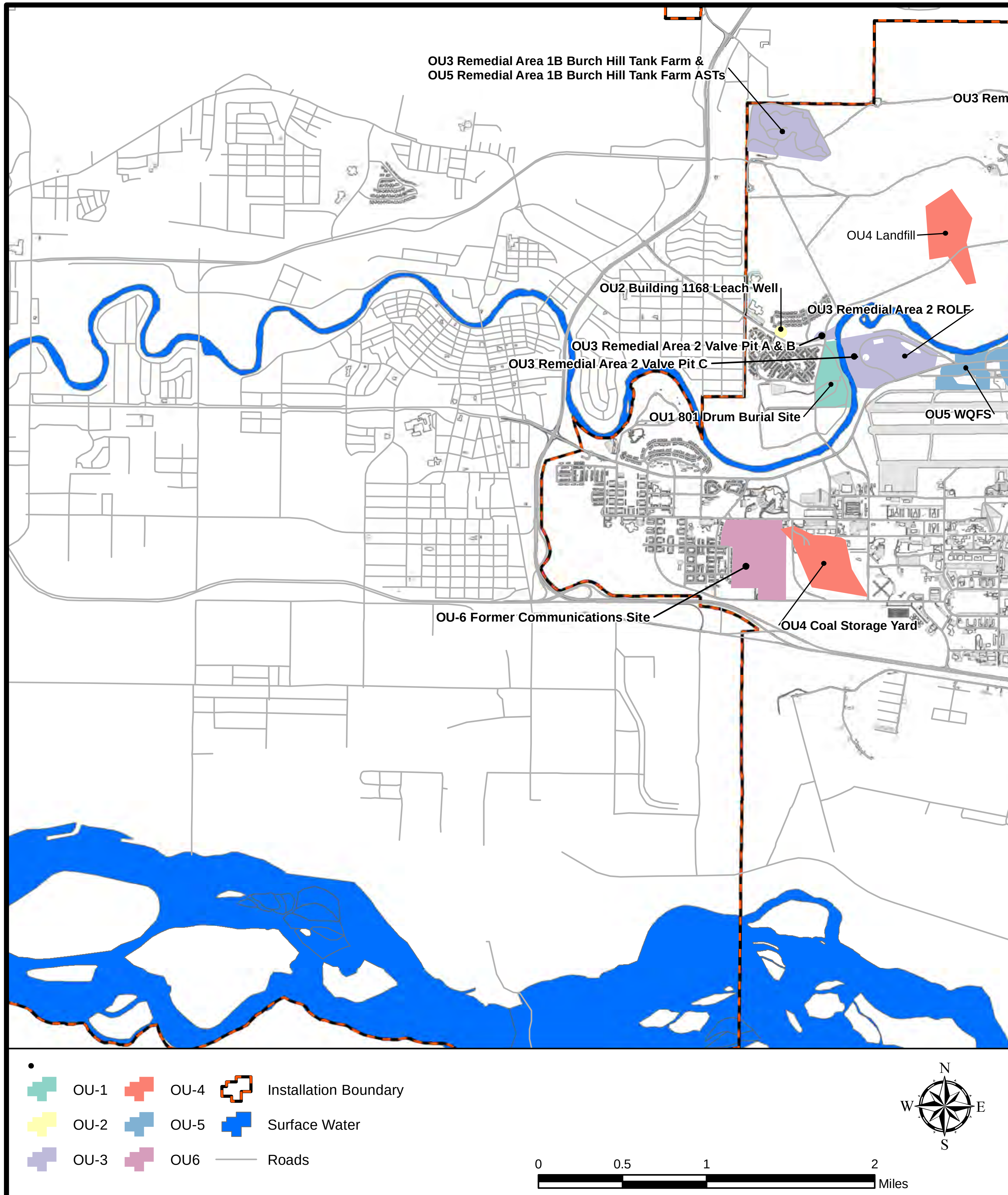
US Army Corps of Engineers
Buffalo District

Fort Wainwright Site Location

Document Name: FWW_SiteLoc_201512.mxd
Drawn By: H5TDEEMP
Date Saved: 09 Dec 2015
Time Saved: 3:52:44 PM

United States Army Garrison
Fort Wainwright, Alaska

Figure 1 - 1



US Army Corps of Engineers
Buffalo District

Operable Unit Locations

Document Name: FWA_OULoc_201512.mxd
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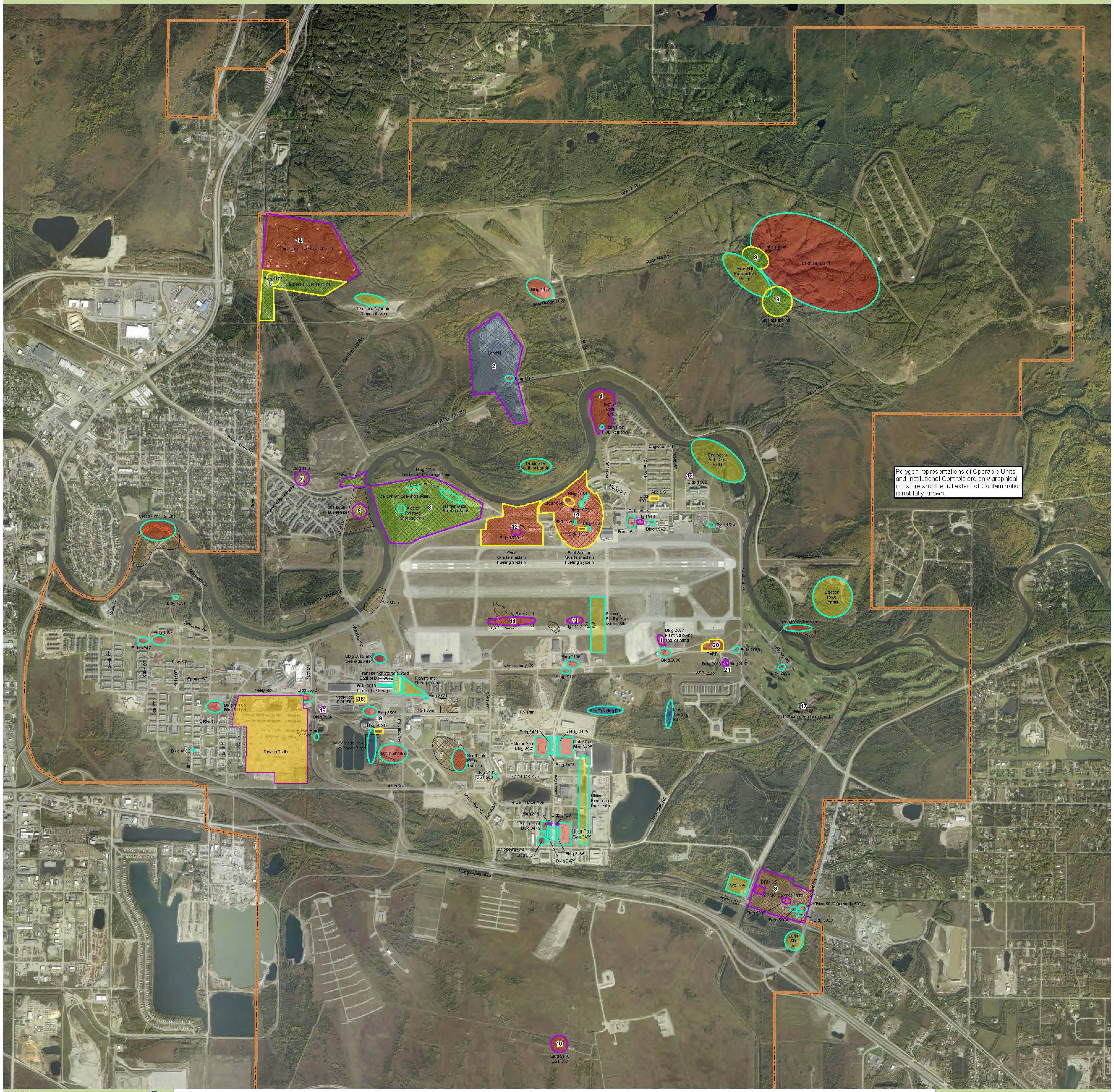
Time Saved: 10:16:11 AM

United States Army Garrison
Fort Wainwright, Alaska

Figure 2 - 1

Restoration Sites On Fort Wainwright, AK



USAG-AK GIS
724 Quartermaster Road
Fort Richardson, AK
907-384-3058

Date: August 23, 2004
Drawn: TAR
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Image:GIS_Projects\Fort_Wainwright\restoration\images\fwa_ou_ic_map_updt_1205.pdf

Operable Units

OU1 OU4
OU2 OU5
OU3 OU6

Legend

Installation Boundary
Institutional Controls

Operable Unit Status

All remedial actions in place
Contamination still being defined
No further action

N
0 500 1,000 Meters
0 0.25 0.5 Miles

For more information about these restoration sites please go to the USAG-AK GIS page at: http://rpw-edms/crrel/usagak_gis.php (Note: You must have access to the USAG-AK Intranet to view this site)

Active Restoration Site Summaries

1 **FTWW-003**
AIRCRAFT MAIN (BUILDING 2077)
RRSE RATING: Low
CONTAMINANTS OF CONCERN: DRO
MEDIA OF CONCERN: Soil, Groundwater
COMPLETED IRP PHASE: PA/SI, RI/FS, RD, RA, RA(O)
CURRENT IRP PHASE: LTM
FUTURE IRP PHASE: LTM

2 **FTWW-038**
FT. WAINWRIGHT LANDFILL PLUME
RRSE RATING: High
CONTAMINANTS OF CONCERN: Solvents
MEDIA OF CONCERN: Groundwater
COMPLETED IRP PHASE: PA/SI, RI/FS, RD, RA
CURRENT IRP PHASE: RA(O)
FUTURE IRP PHASE: RA(O)

3 **FTWW-047**
DRMO SALVAGE YARD
RRSE RATING: High
CONTAMINANTS OF CONCERN: TCE, PCE, POL
MEDIA OF CONCERN: Soil, Groundwater
COMPLETED IRP PHASE: PA/SI, RI/FS, RD, RA
CURRENT IRP PHASE: RA(O)
FUTURE IRP PHASE: RA(O), LTM

4 **FTWW-050**
NORTH POST SITE
RRSE RATING: Low
CONTAMINANTS OF CONCERN: Benzene, POL Components
MEDIA OF CONCERN: Soil, Groundwater
COMPLETED IRP PHASE: PA/SI, RI/FS, IRA, RD, RA, RA(O)
CURRENT IRP PHASE: LTM
FUTURE IRP PHASE: LTM

5 **FTWW-055**
FAIRBANKS FUEL TERMINAL
RRSE RATING: High
CONTAMINANTS OF CONCERN:
Benzene, Free Product, Solvents, EDB; 1,2 DCA
MEDIA OF CONCERN: Soil, Groundwater
COMPLETED IRP PHASE: PA/SI, RI/FS, RD, RA
CURRENT IRP PHASE: RA(O)
FUTURE IRP PHASE: RA(O), LTM

6 **FTWW-067**
801 DRUM BURIAL SITE
RRSE RATING: High
CONTAMINANTS OF CONCERN: Aldrin, Dieldrin
MEDIA OF CONCERN: Soil, Groundwater
COMPLETED IRP PHASE: PA/SI, RI/FS, 4 IRAs, RD, RA
CURRENT IRP PHASE: RA(O)
FUTURE IRP PHASE: RA(O)

7 **FTWW-072**
OIL WATER SEPARATOR AT BLDG 1168
RRSE RATING: Low
CONTAMINANTS OF CONCERN: DRO
MEDIA OF CONCERN: Soil, Groundwater
COMPLETED IRP PHASE: PA/SI, RI/FS, IRA, RD, RA, RA(O)
CURRENT IRP PHASE: LTM
FUTURE IRP PHASE: RC

8 **FTWW-083**
RAILROAD OFF-LOADING FACILITY
RRSE RATING: High
CONTAMINANTS OF CONCERN: POL
MEDIA OF CONCERN: Soil, Groundwater
COMPLETED IRP PHASE: PA/SI, RI/FS, 2 IRAs, RD, RA
CURRENT IRP PHASE: RA(O)
FUTURE IRP PHASE: RA(O), LTM

9 **FTWW-084**
FAIRBANKS EIELSON PIPELINE SPILLS
RRSE RATING: High
CONTAMINANTS OF CONCERN: POL
MEDIA OF CONCERN: Soil, Groundwater
COMPLETED IRP PHASE: PA/SI, RI/FS, 2 IRAs, RD, RA
CURRENT IRP PHASE: RA(O)
FUTURE IRP PHASE: RA(O)

10 **FTWW-085**
UST, BLDG 5110
RRSE RATING: Low
CONTAMINANTS OF CONCERN: DRO, BTEX
MEDIA OF CONCERN: Soil, Groundwater
COMPLETED IRP PHASE: PA/SI, RI/FS, 3 IRAs, RD, RA, RA(O)
CURRENT IRP PHASE: LTM
FUTURE IRP PHASE: LTM

11 **FTWW-087**
UST, BLDG 2111 & 2112
RRSE RATING: Medium
CONTAMINANTS OF CONCERN: POL
MEDIA OF CONCERN: Soil, Groundwater
COMPLETED IRP PHASE: PA/SI, RI/FS, 3 IRAs, RA
CURRENT IRP PHASE: RA(O)
FUTURE IRP PHASE: RA(O), LTM

12 **FTWW-094**
FORMER QUARTERMASTERS FUELING SYSTEM EAST/WEST
RRSE RATING: High
CONTAMINANTS OF CONCERN:
POL, Benzene, 1,2DCA, EDB
MEDIA OF CONCERN: Soil, Groundwater
COMPLETED IRP PHASE: PA/SI, RI/FS, 2 IRAs, RD, RA
CURRENT IRP PHASE: RA(O)
FUTURE IRP PHASE: RA(O), LTM

13 **FTWW-095**
UST, BLDG 1002
RRSE RATING: Low
CONTAMINANTS OF CONCERN: Benzene
MEDIA OF CONCERN: Groundwater
COMPLETED IRP PHASE: PA/SI, RI/FS, IRA, RD, RA, RA(O)
CURRENT IRP PHASE: LTM
FUTURE IRP PHASE: LTM

14 **FTWW-096**
BIRCH HILL ASTS
RRSE RATING: Medium
CONTAMINANTS OF CONCERN: Lead, POL
MEDIA OF CONCERN: Soil
COMPLETED IRP PHASE: PA/SI, RI/FS, RA, RA(O)
CURRENT IRP PHASE: LTM
FUTURE IRP PHASE: LTM

15 **FTWW-097**
UST, BLDG 1168
RRSE RATING: Low
CONTAMINANTS OF CONCERN: POL
MEDIA OF CONCERN: Groundwater
COMPLETED IRP PHASE: PA/SI, RI/FS, IRA, RD, RA, RA(O)
CURRENT IRP PHASE: LTM
FUTURE IRP PHASE: LTM

16 **FTWW-099**
UST, BLDG 3564 (UST 283, 284)
RRSE RATING: Medium
CONTAMINANTS OF CONCERN:
Benzene, GRO, DRO, BTEX
MEDIA OF CONCERN: Soil, Groundwater
COMPLETED IRP PHASE: PA/SI, RI/FS, IRA, RA, RA(O)
CURRENT IRP PHASE: LTM
FUTURE IRP PHASE: LTM

17 **FTWW-100**
UST, BLDG 2250
RRSE RATING: Low
CONTAMINANTS OF CONCERN: DRO
MEDIA OF CONCERN: Soil, Groundwater
COMPLETED IRP PHASE: PA/SI, RI/FS, 2 IRAs, RA, RA(O)
CURRENT IRP PHASE: LTM
FUTURE IRP PHASE: LTM

18 **FTWW-101**
NEELY ROAD POL POINT
RRSE RATING: High
CONTAMINANTS OF CONCERN: Benzene, DRO, GRO, BTEX
MEDIA OF CONCERN: Soil, Groundwater
COMPLETED IRP PHASE: PA
CURRENT IRP PHASE: RI/FS (funded), RA
FUTURE IRP PHASE: RA(O), LTM

Compliance Clean-Up Site Summaries

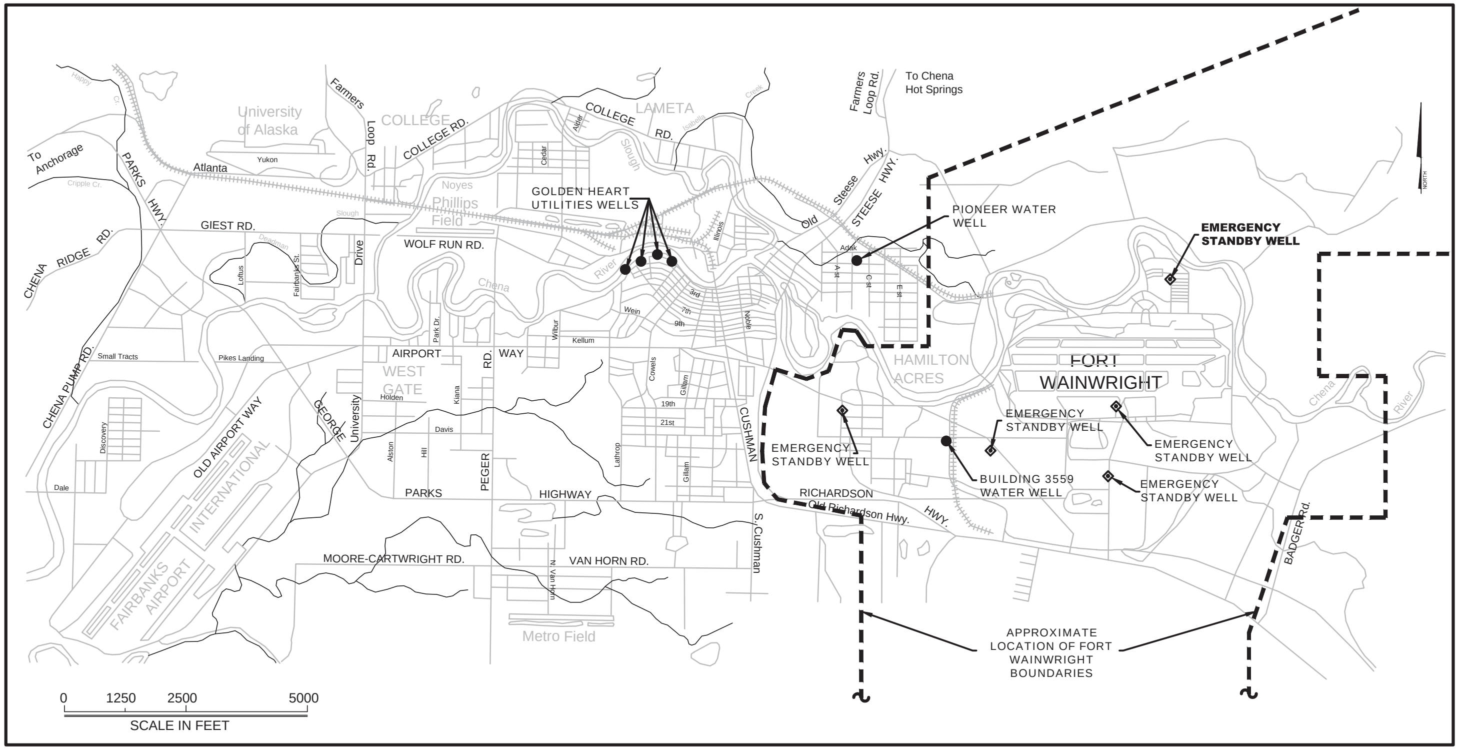
19 **FTWWCC-01**
BLDG 3598/3595 SITE
CONTAMINANTS OF CONCERN: POL
MEDIA OF CONCERN: Soil, Groundwater
SITE TYPE: UST
LAND USE: Industrial
COMPLETED PHASE: PA/SI
CURRENT PHASE: RI/FS
FUTURE PHASE: RA, RA(O)

20 **FTWWCC-02**
FORWARD AIR REFUELING POINT (FARP)
CONTAMINANTS OF CONCERN: Unknown
MEDIA OF CONCERN: Unknown
SITE TYPE: AST
LAND USE: Industrial
COMPLETED PHASE: N/A
CURRENT PHASE: N/A
FUTURE PHASE: N/A

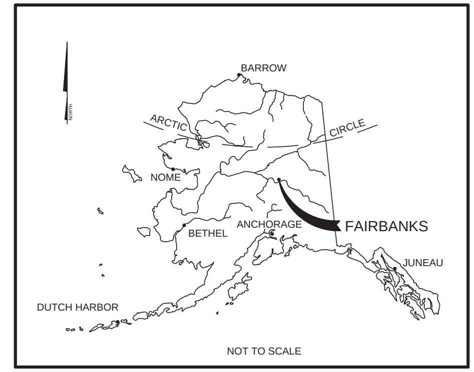
21 **FTWWCC-03**
VET CLINIC/BOAT SHOP (BLDGS 2062/2063)
CONTAMINANTS OF CONCERN: POL
MEDIA OF CONCERN: Soil, Groundwater
SITE TYPE: UST
LAND USE: Industrial
COMPLETED PHASE: PA/SI, RI
CURRENT PHASE: LTM
FUTURE PHASE: LTM

Acronyms and Abbreviations Used:
Preliminary Assessment (PA), Remedial Action (RA), Remedial Action Operation (RA(O)), Remedial Design (RD), Remedial Investigation (RI), Site Inspection (SI), Interim Remedial Action (IRA), Installation Restoration Program (IRP), Feasibility Study (FS), Volatile Organic Compounds (VOC)

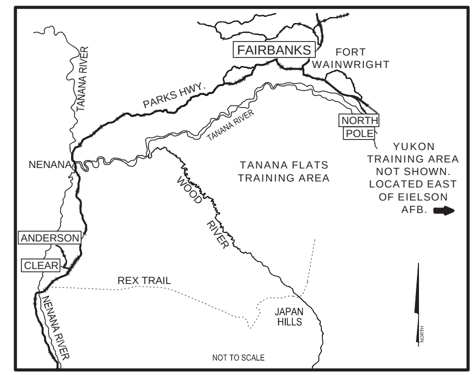
Synopsis From Fort Wainwright Installation Action Plan FY05



Fairbanks and Fort Wainwright Site Map



Location Map



Vicinity Map

LEGEND

- ● DRINKING WATER WELL LOCATION
- ◈ EMERGENCY STANDY WELL LOCATION. USED PRIMARILY FOR FIRE SUPPRESSION

Fort Wainwright and Surrounding Areas

Five Year Review
Fort Wainwright, Alaska

FIGURE:	DATE:
3-1	9/11

789AF

ROD Cleanup Level (µg/L)

Benzene	5
1,1-Dichloroethene	7
cis-1,2-Dichloroethene	70
Vinyl Chloride	2
Dieldrin	0.004
DRO	1,500

ADEC Cleanup Level (µg/L)

Dieldrin	0.05

- 2015 Groundwater Sampling Results Exceed ROD Cleanup Levels
- 2015 Groundwater Sampling Results Do Not Exceed ROD Cleanup Levels
- Not Included in 2015 Sampling Event
- Underground Storm Sewer
- Institutional Control Boundary

N W E S

0 150 300 600 Feet

U.S. Army Corps of Engineers
Buffalo, New York

OU-1 801 Drum Burial Site Features

Document Name: FWA_OU1_801_201511.mxd
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Date Saved: 31 Oct 2016
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United States Army Garrison
Fort Wainwright, Alaska

FIGURE 5-1

ROD Cleanup Level (ug/L)

Benzene	5
PCE	5
TCE	5
1,1-Dichloroethene	7
cis-1,2-Dichloroethene	70
Vinyl Chloride	2

- 2015 Groundwater Sampling Results Exceed ROD Cleanup Levels
- 2015 Groundwater Sampling Results Do Not Exceed ROD Cleanup Levels
- Not Included in 2015 Sampling Event
- Approximate Groundwater Flow Direction
- Former Building 1168
- Active Railroad - Single
- Institutional Control Boundary

N E S W

0 50 100 200 Feet

U.S. Army Corps of Engineers
Buffalo, New York

OU-2 Former Building 1168 Site Features

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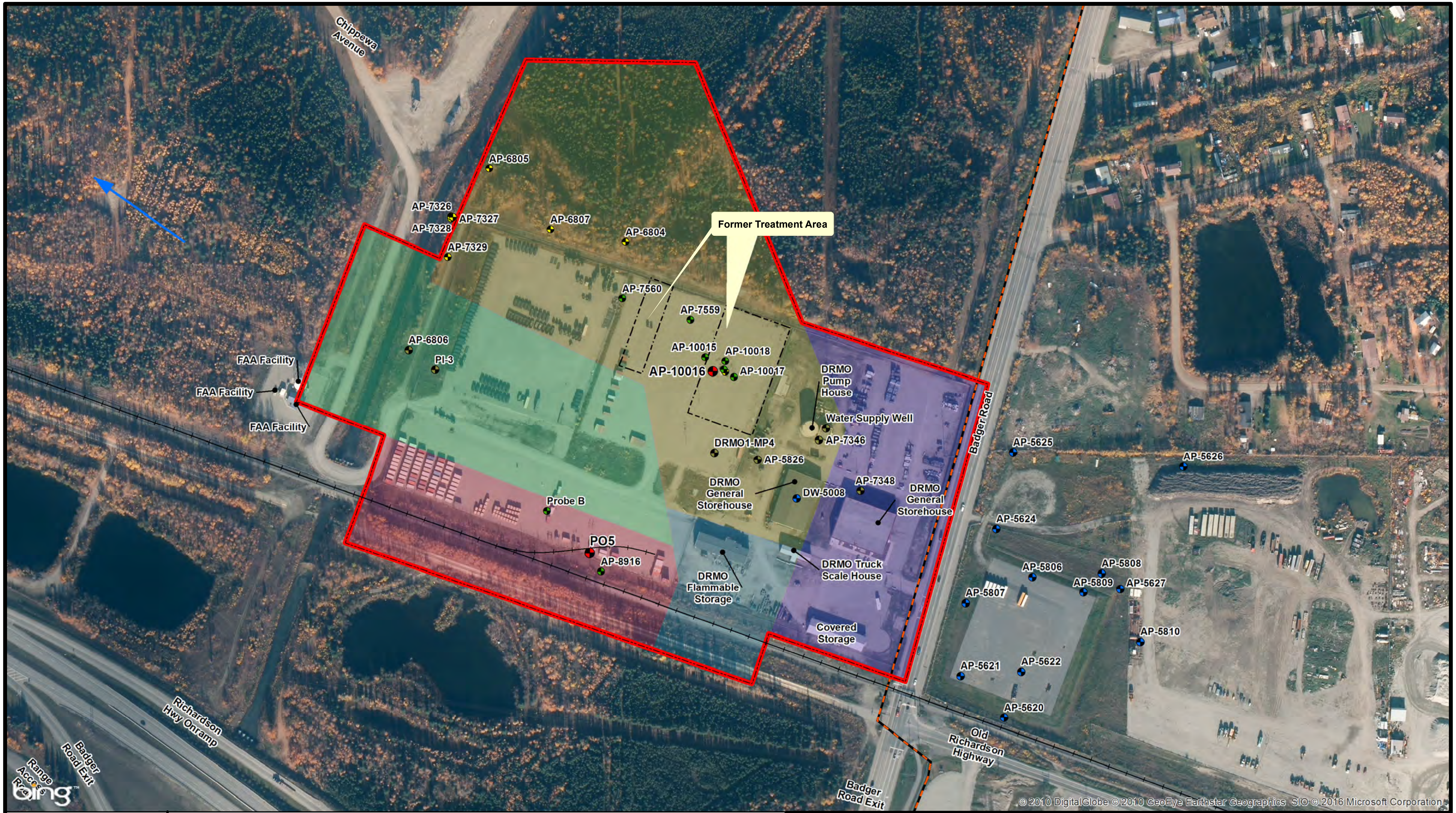
Time Saved: 3:44:55 PM

United States Army Garrison
Fort Wainwright, Alaska

Figure 5-2



ROD Cleanup Level (µg/L)

Benzene	5
PCE	5
TCE	5
1,1-Dichloroethene	7
cis-1,2-Dichloroethene	70
Vinyl Chloride	2

- 2015 Groundwater Sampling Results Exceed ROD Cleanup Levels
- 2015 Groundwater Sampling Results Do Not Exceed ROD Cleanup Levels
- Not Included in 2015 Sampling
- 2-Party Groundwater Monitoring Well
- Domestic Water Well
- Approximate Groundwater Flow Direction
- Active Railroad - Single
- Institutional Control Boundary
- Subarea DRMO1
- Subarea DRMO2
- Subarea DRMO3
- Subarea DRMO4
- Subarea DRMO5
- Installation Boundary

N W E S

0 125 250 500 Feet

U.S. Army Corps of Engineers
US Army Corps of Engineers
Buffalo District
Buffalo, New York

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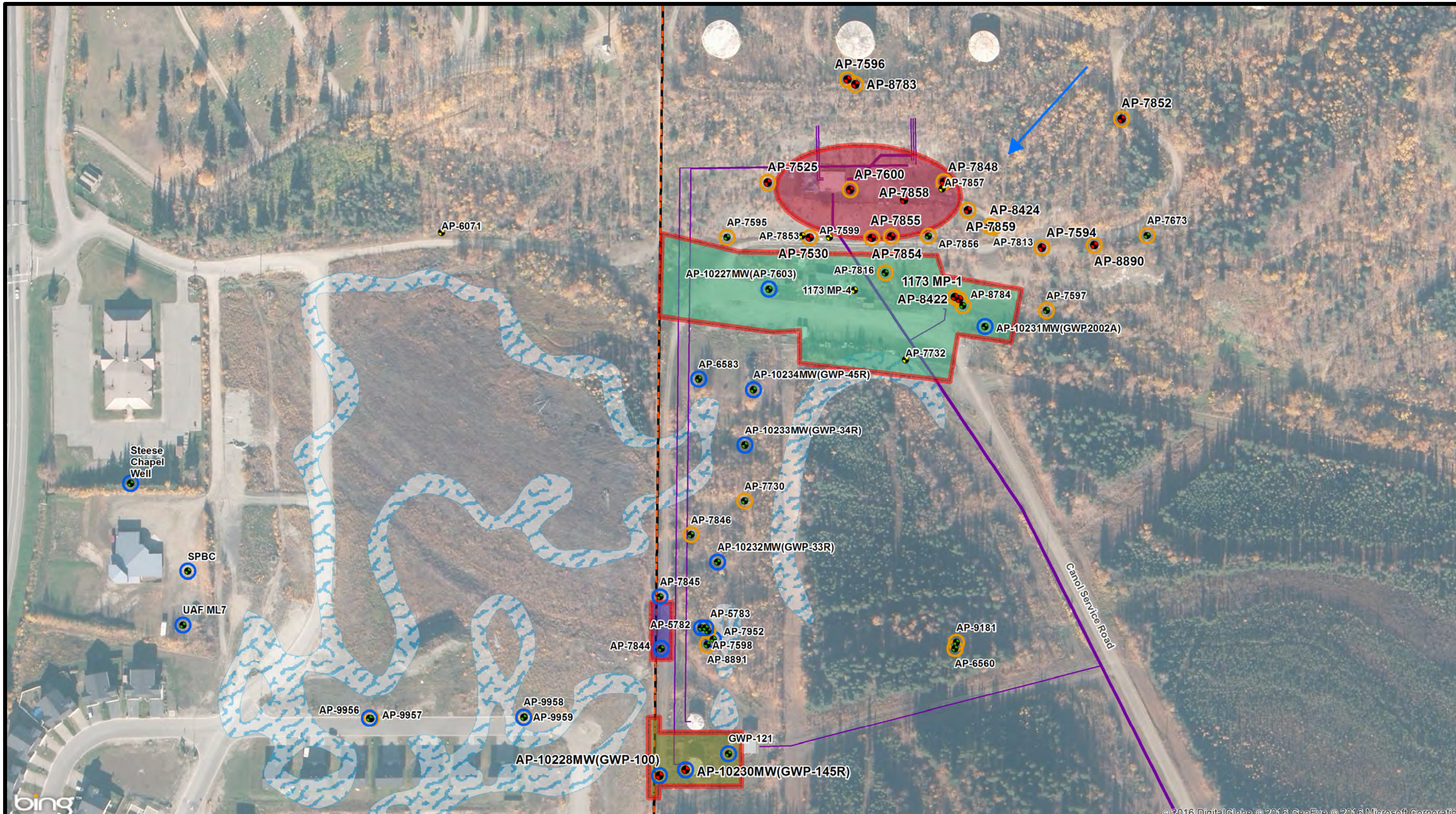
OU-2 DRMO Subareas and Site Features

United States Army Garrison
Fort Wainwright, Alaska

Figure 5-3



ROD Cleanup Levels (ug/L)

Benzene	5
Toluene	1,000
Ethylbenzene	700
1,2-EDB	0.05
1,2-DCA	5
1,2,4-TMB	1850
1,3,5-TMB	1850

2014 Groundwater Sampling Results Exceed ROD Cleanup Levels
2014 Groundwater Sampling Results Do Not Exceed ROD Cleanup Levels
Not Included in 2014 Sampling Event
Alluvial Well
Bedrock Well
Approximate Groundwater Flow Direction
Institutional Control Boundary
Former Building 1173 Treatment System
Former Thaw Channel Treatment System
Former Truck Fill Stand Treatment System
Product Recovery Extraction Well Area
Fuel Line - Main
Installation Boundary
Approximate Location of Permafrost - Provided by CRREL,2010

N W E S

0 125 250 500 Feet

U.S. Army Corps of Engineers
US Army Corps of Engineers Buffalo District
Buffalo, New York

Document Name: FWA_OU3_BHTF_201511.mxd
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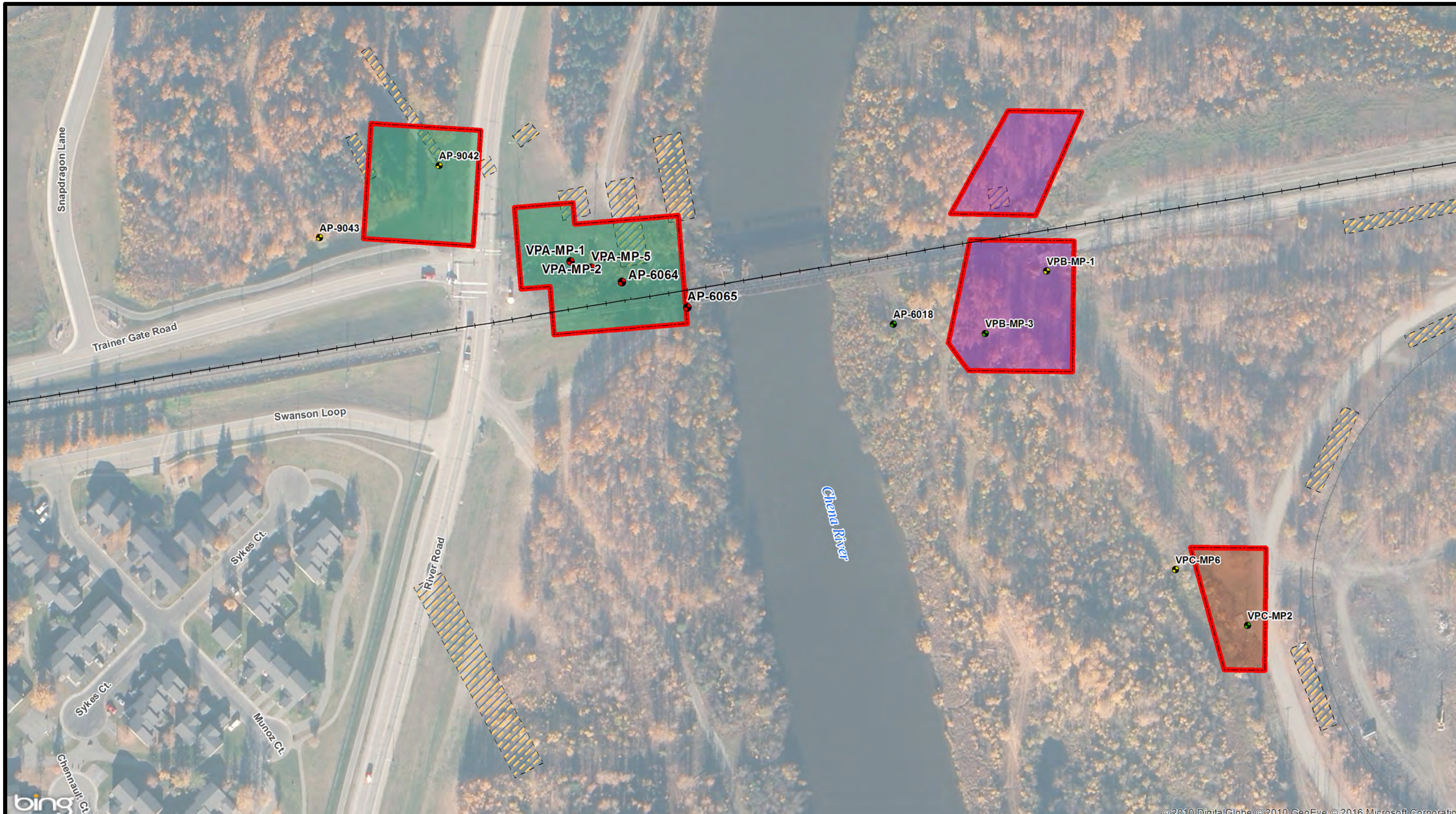
OU-3 Birch Hill Tank Farm Site Features

United States Army Garrison
Fort Wainwright, Alaska

Figure 5-4



ROD Cleanup Level (ug/L)

Benzene	5
Toluene	1,000
Ethylbenzene	700
1,2-EDB	0.05
1,2-DCA	5
1,2,4-TMB	1850
1,3,5-TMB	1850

Exceeds ROD Cleanup Levels
Does Not Exceed ROD Cleanup Levels
Not Included in 2015 Sampling Event
Active Railroad - Single
Dismantled Railroad
Institutional Control Boundary
Valve Pit A
Valve Pit B
Valve Pit C
Demolished Structure

N W E S

0 75 150 300 Feet

U.S. Army Corps of Engineers
Buffalo, New York
US Army Corps of Engineers Buffalo District

OU-3 Valve Pits A, B, and C Site Features

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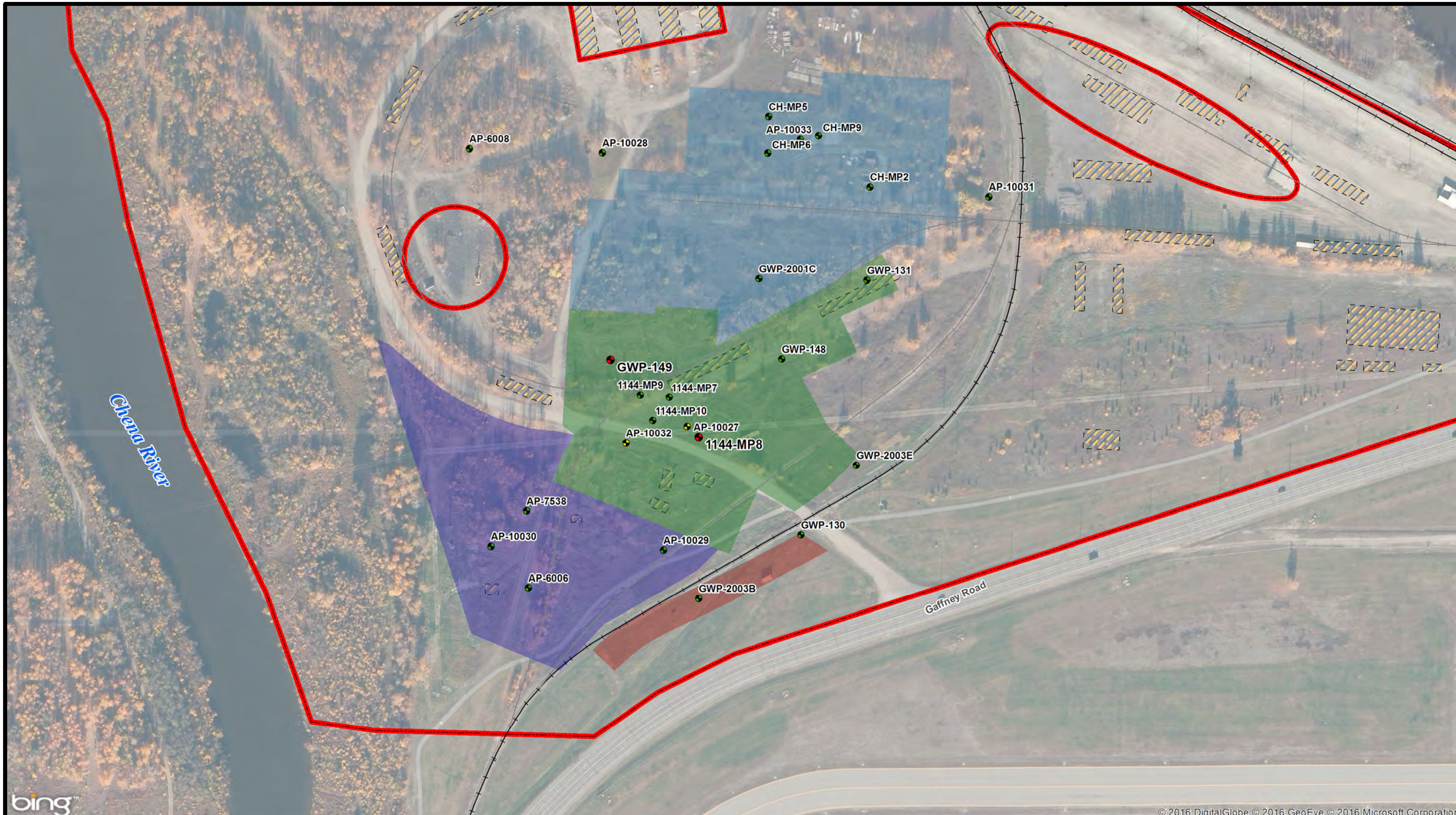
United States Army Garrison
Fort Wainwright, Alaska

Figure 5-5



ROD Cleanup Level (ug/L)

Benzene	5
Toluene	1,000
Ethylbenzene	700
1,2-EDB	0.05
1,2-DCA	5
1,2,4-TMB	1850
1,3,5-TMB	1850

2014 Groundwater Sampling Results Exceed ROD Cleanup Levels
2014 Groundwater Sampling Results Do Not Exceed ROD Cleanup Levels
Not Included in 2014 Sampling Event
Active Railroad - Single
Dismantled Railroad
Centeral Header Treatment System
Eight Car Header Treatment System
Former Building 1144 Treatment System
Upgradient Area Treatment System
Institutional Control Boundary
Demolished Structure

N W E S

0 125 250 500 Feet

U.S. Army Corps of Engineers
Buffalo, New York
US Army Corps of Engineers Buffalo District

Document Name: FWA_OU3_ROLF_201511.mxd
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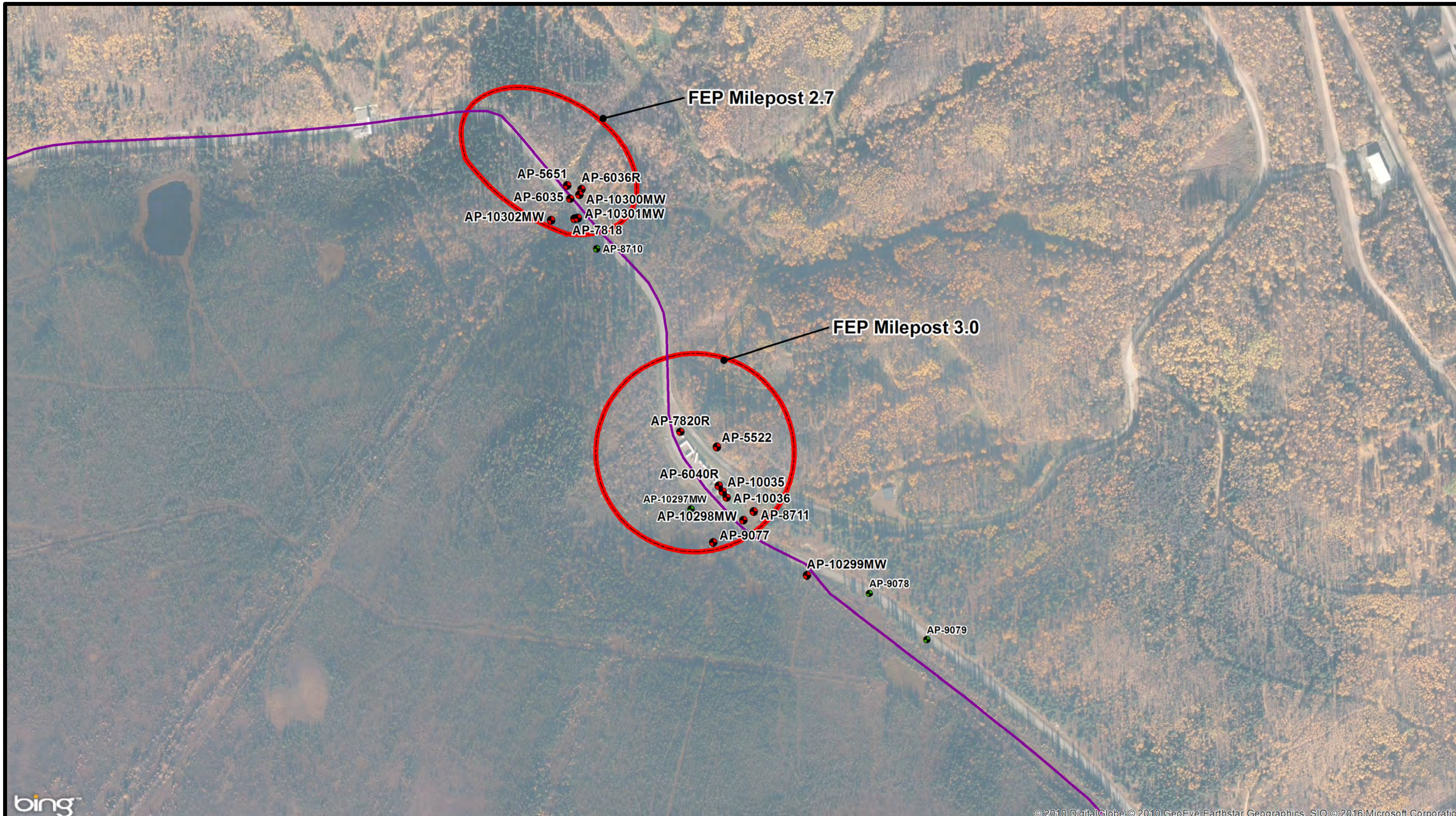
OU-3 ROLF Site Features

United States Army Garrison
Fort Wainwright, Alaska

Figure 5-6



ROD Cleanup Level (ug/L)

Benzene	5
Toluene	1,000
Ethylbenzene	700
1,2-EDB	0.05
1,2-DCA	5
1,2,4-TMB	1850
1,3,5-TMB	1850

2015 Groundwater Sampling Results Exceed ROD Cleanup Levels

2015 Groundwater Sampling Results Do Not Exceed ROD Cleanup Levels

Not Included in 2015 Sampling Event

Fairbanks-Eielson Pipeline

Institutional Control Boundary

N W E S

0 125 250 500 Feet

U.S. Army Corps of Engineers
Buffalo, New York

US Army Corps of Engineers
Buffalo District

OU-3 Mileposts 2.7 and 3.0 Site Features

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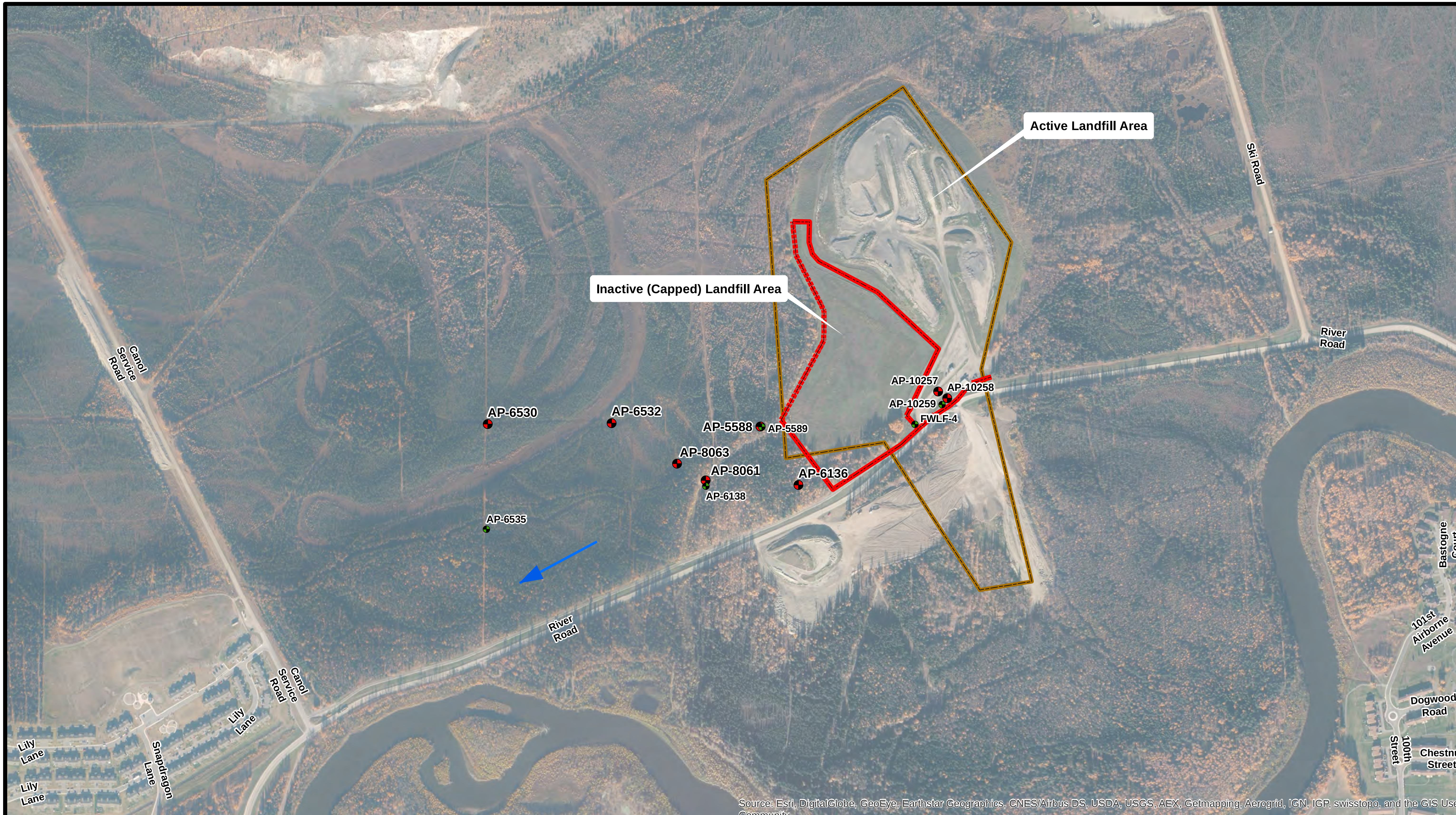
United States Army Garrison
Fort Wainwright, Alaska

Figure 5-7



ROD Cleanup Level (ug/L)

Benzene	5
cis-1,2-DCE	70
1,1,2,2-PCA	5.2
1,1,2-TCA	5
TCE	5
Vinyl Chloride	2
bis(2-ethylhexyl) Phthalate	6

- 2014 Groundwater Sampling Results Exceed ROD Cleanup Levels
- 2014 Groundwater Sampling Results Do Not Exceed ROD Cleanup Levels
- Institutional Control Boundary
- Approximate Groundwater Flow Direction
- Landfill Area

0 250 500 1,000 Feet

N S E W

U.S. Army Corps of Engineers
Buffalo, New York

US Army Corps of Engineers
Buffalo District

OU-4 Landfill Site Features

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United States Army Garrison
Fort Wainwright, Alaska

Figure 5-8

Domestic Water - In Use

Former AS/SVE Treatment System Boundary

Active Railroad - Single

Dismantled Railroad

Coal Storage Yd and Bldg 3595

Institutional Control Boundary

N W E S

0 125 250 500 Feet

U.S. Army Corps of Engineers
Buffalo, New York

US Army Corps of Engineers
Buffalo District

OU-4 Coal Storage Yard Site Features

Document Name: FWA_OU4_Coal_201512.mxd
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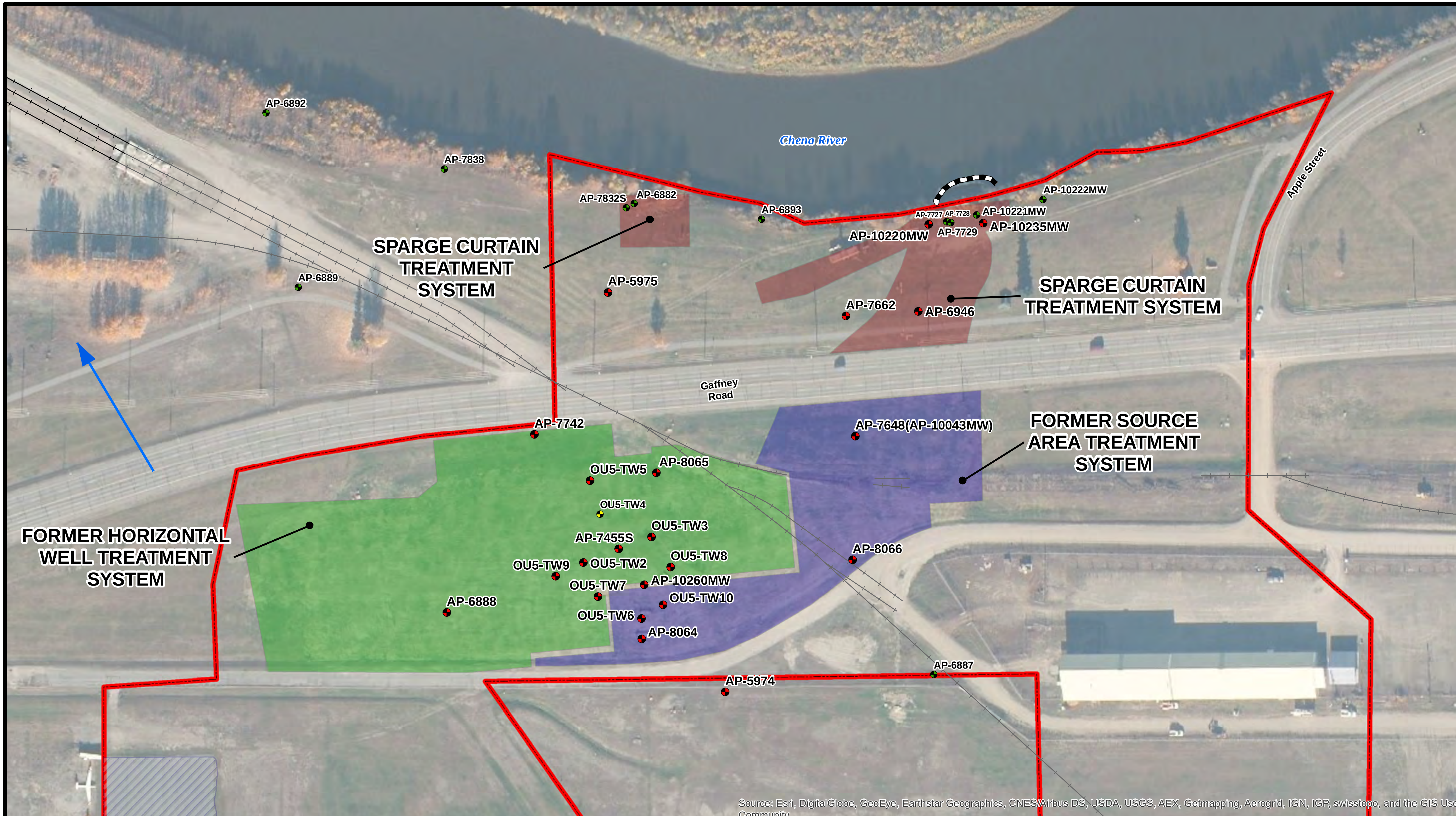
United States Army Garrison
Fort Wainwright, Alaska

Figure 5-9



ROD Cleanup Levels (ug/L)

DRO	1,500
GRO	2,200
1,2-DCA	5
Benzene	5
Toluene	1,000
TAH	10
TAqH	15
TCE	5

- 2015 Groundwater Sampling Results Exceed ROD Cleanup Levels
- 205 Groundwater Sampling Results Do Not Exceed ROD Cleanup Level
- Not Included in 2015 Sampling
- Chena River Boom
- Railroad-Active
- Railroad-Dismantled
- Approximate Groundwater Flow Direction
- Institutional Control Boundary
- FORMER HORIZONTAL WELL TREATMENT SYSTEM
- FORMER SOURCE AREA TREATMENT SYSTEM
- SPARGE CURTAIN TREATMENT SYSTEM

N W E S

0 100 200 400 Feet

U.S. Army Corps of Engineers
Buffalo, New York
US Army Corps of Engineers Buffalo District

OU-5 WQFS Site Features

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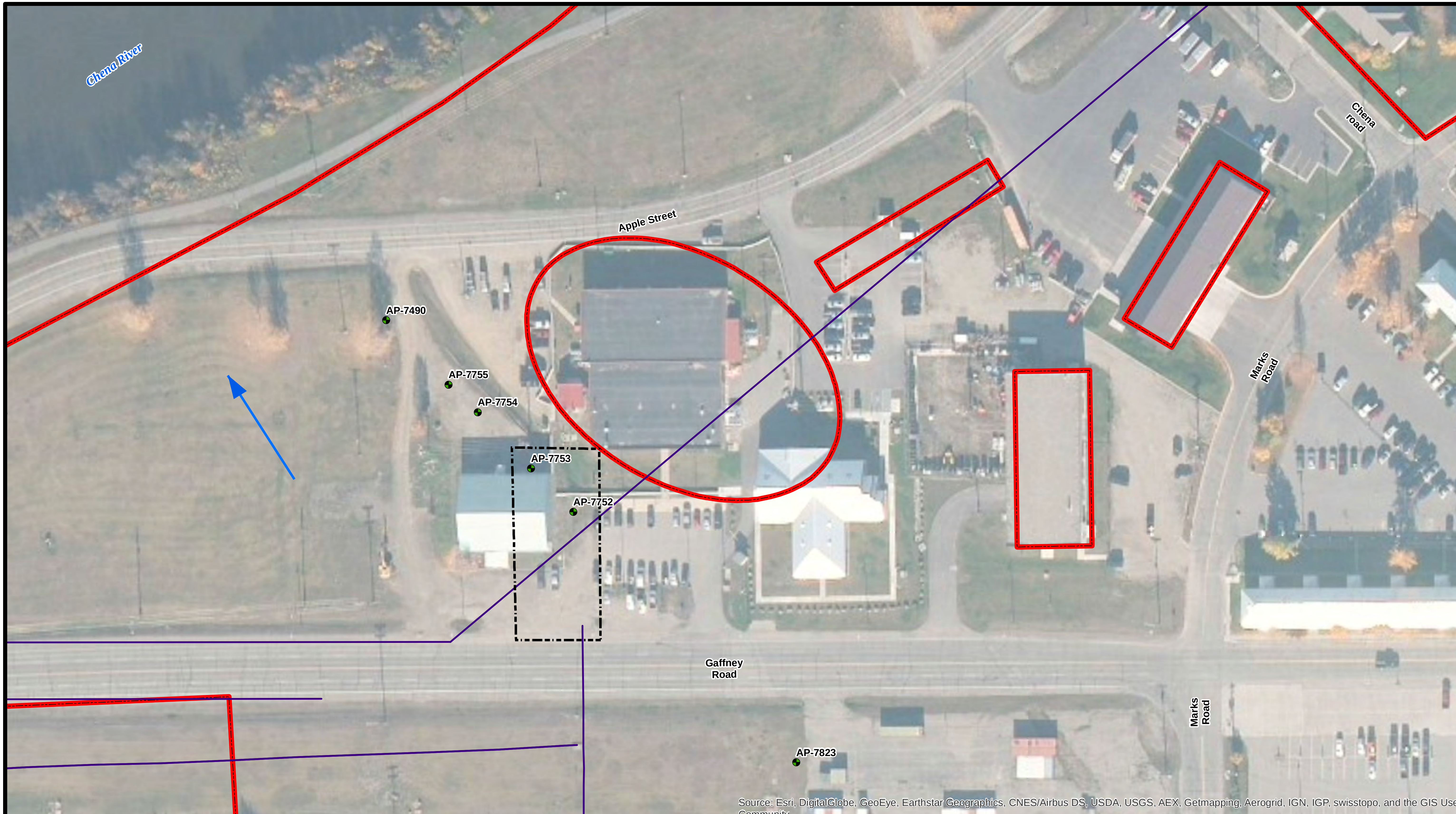
United States Army Garrison
Fort Wainwright, Alaska

Figure 5-10



ROD Cleanup Levels (ug/L)

DRO	1,500
GRO	2,200
1,2-DCA	5
Benzene	5
Toluene	1,000
TAH	10
TAqH	15
TCE	5

- 2015 Groundwater Sampling Results Do Not Exceed ROD Cleanup Levels
- Former AS/SVE Treatment System
- Approximate Groundwater Flow Direction
- Fuel Line - Main
- Institutional Control Boundary

N W E S

0 100 200 400 Feet

U.S. Army Corps of Engineers
Buffalo, New York
US Army Corps of Engineers Buffalo District

OU-5 EQFS Site Features

Document Name: FWA_OU5EQFS_201511.mxd
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Date Saved: 23 Aug 2016
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United States Army Garrison
Fort Wainwright, Alaska

Figure 5-11

ROD Cleanup Levels (mg/kg)

Lead	1,000

- Maximum Concentration of Total Lead in Soil Detected at AST Exceedes ROD Cleanup Level
- Institutional Control Boundary
- Former Above Ground Storage Tank (AST) Locations
- Installation Boundary
- Unimproved Road

N W E S

0 125 250 500 Feet

U.S. Army Corps of Engineers
US Army Corps of Engineers Buffalo District
Buffalo, New York

Document Name: FWA_OU5_BHTFAST_201511.mxd
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Time Saved: 8:15:32 AM

OU-5 Birch Hill Tank Farm - Above Ground Storage Tanks
Site Features

United States Army Garrison
Fort Wainwright, Alaska

Figure 5-12

Institutional Control Boundary

N
W E
S

0 100 200 400 Feet

US Army Corps of Engineers
Buffalo District

OU-5 Open Burning Open Detonation Area Site Features

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United States Army Garrison
Fort Wainwright, Alaska

Figure 5 - 13

ROD Cleanup Levels (ug/L)

DRO	1,500
RRO	1,100
Trichloroethene(TCE)	5
1,2,3-Trichloropropane(TCP)	0.12

Monitoring Well Sampled for MNA Program

Institutional Control Boundary

Approximate Groundwater Flow Direction

Current Structures

Roads

N W E S

0 150 300 600 Feet

U.S. Army Corps of Engineers
Buffalo District

US Army Corps of Engineers Buffalo District

OU-6 Former Communications Site Features

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Drawn By: H5TDEEMP
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Time Saved: 2:32:00 PM

United States Army Garrison
Fort Wainwright, Alaska

Figure 5-14

ATTACHMENT 2

Documents Reviewed

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ATTACHMENT 3

Decision Document Summaries

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Table A3-1 Decision Document Summary
Component: Background/Basis for Taking Action
Operable Unit 1 - 801-Drum Burial Site

Decision Document Title:	Record of Decision for Operable Unit 1 fort Wainwright Fairbanks, Alaska, June 1997
Regulatory Framework:	CERCLA NPL
Remedy Chosen:	Alternative 4 - Drum Removal and Disposal, and Natural Attenuation of Groundwater with Long-Term Groundwater Monitoring/Evaluation with Institutional Controls with a Contingency for Soil Vapor Extraction and Air Sparging to Treat Soil and Groundwater. (Page 7-1)
Media of Concern:	Groundwater and soil
Contaminants of Concern (COCs):	Groundwater: 1,1-dichloroethene (DCE), benzene, vinyl chloride, aldrin, dieldrin, and diesel range organics (DRO) Soil: Aldrin, dieldrin, and DRO
Land Use:	Current: Recreational Future: Recreational
Receptors:	Army personnel (residential), small mammals (e.g., shrews and voles)
Exposure Pathway:	Inhalation, ingestion, dermal contact
Ecological Risk:	• Potential ecological risks may result from exposure of terrestrial wildlife to chemicals of potential ecological concern found in the surface soils at the 801 Drum Burial Site. • Potential ecological risk may result from exposure of aquatic organisms to chemicals of potential ecological concern found in surface water and sediment.

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Table A3-2 Decision Document Summary
Component: Remedial Action
Operable Unit 1 - 801 Drum Burial Site

Decision Document Title:	Record of Decision for Operable Unit 1 fort Wainwright Fairbanks, Alaska, June 1997
Remedy Chosen:	Alternative 4 - Drum Removal and Disposal, and Natural Attenuation of Groundwater with Long-Term Groundwater Monitoring/Evaluation with Institutional Controls with a Contingency for Soil Vapor Extraction and Air Sparging to Treat Soil and Groundwater. (Page 7-1)
Remedial Action Objectives (RAOs):	Groundwater: • Ensure that groundwater quality at the 801 Drum Burial Site meets Federal and state standards • Minimize potential migration of contaminated groundwater to the Chena River and downgradient drinking water wells • Establish and maintain institutional controls (ICs) to ensure that the groundwater will not be used until Federal and state maximum contaminant levels (MCLs) are attained, except for activities undertaken to initiate the selected remedies Soil: • Prevent further leaching of contaminants from soil to groundwater • Reduce risks associated with exposure to contaminated soil and drums • Prevent migration of soil contaminants to groundwater which could result in groundwater contamination and exceedances of federal MCLs and Alaska Water Quality Standards (AWQS) (18 Alaska Administrative Code [AAC] 70)
Clean-Up Goals:	Groundwater: Five contaminants of concern (COCs) were established for groundwater in the ROD: aldrin, dieldrin, 1,1-DCE, benzene, and vinyl chloride. When available, federal and State of Alaska drinking water MCLs were adopted as the groundwater cleanup goals. At the time of the Record of Decision (ROD), MCLs were available and used for 1,1-DCE, benzene, and vinyl chloride. There were no MCLs for aldrin or dieldrin and the cleanup levels for these COCs were risk-based concentrations equivalent to an excess lifetime cancer risks of $1x10^{-6}$ for residential exposure scenarios. Since the ROD was finalized, groundwater cleanup levels for aldrin and dieldrin have been instituted. The MCLs for 1,1-DCE, benzene, and vinyl chloride have not changed, but the new MCLs for aldrin and dieldrin (18AAC Table C) are an order of magnitude higher than the risk-based levels adopted in the ROD. In addition, the USEPA has requested that cis-1,2-DCE be added to the list of compounds to track at the site. Soil: Two COCs were established for soils in the ROD; aldrin and dieldrin. Since there were no cleanup levels for either contaminant at the time of the ROD, soil cleanup goals were established based on calculated excess lifetime cancer risks

Table A3-2 Decision Document Summary
Component: Remedial Action
Operable Unit 1 - 801 Drum Burial Site

	of 1×10^{-4} for a residential exposure scenario. Since the ROD was finalized, soil cleanup levels for aldrin and dieldrin have been established. The new cleanup levels for aldrin and dieldrin are lower than the risk-based levels adopted in the ROD.
Applicable or Relevant and Appropriate Requirements:	• Federal and State of Alaska MCLs - relevant and appropriate for groundwater • National Contingency Plan (NCP) off-site disposal rules - applicable for disposal of drums and contaminated soil
Components of the Remedy:	• Source Removal: Locate potential buried drums and, if found, remove and dispose the drums and contaminated soils, while restricting access to the source area during this work • Monitored natural attenuation (MNA)/Long-term monitoring: Natural attenuation of groundwater with long-term monitoring/evaluation • Air Sparging/Soil Vapor Extraction (AS/SVE): install and operate an AS/SVE system to treat volatile organic compounds (VOCs); to be implemented if the plume shows an increasing trend over any three consecutive sampling events, or if designated monitoring points indicate the plume is migrating. • ICs: Establish and maintain ICs to ensure that the groundwater will not be used until Federal and state MCLs are attained, except for activities undertaken to initiate the selected remedies. Included are restrictions on site access, well installation and development as long as hazardous substances remain on site that preclude unrestricted use.

Table A3-3 Decision Document Summary
Component: Background/Basis for Taking Action
Operable Unit 2 - Former Building 1168 Leach Well

Decision Document Title:	Record of Decision for Operable Unit 2 Fort Wainwright Fairbanks, Alaska, January 1997
Regulatory Framework:	CERCLA NPL
Remedy Chosen:	Alternative 3: Soil Vapor Extraction, Groundwater Air Sparging, and Monitoring
Media of Concern:	Groundwater
Contaminants of Concern (COCs):	Groundwater: Benzene, trichloroethene (TCE), Tetrachloroethene (PCE), vinyl chloride, 1,1-DCE, and cis-1,2 DCE
Land Use:	Current: industrial; residential for groundwater Future: industrial; residential for groundwater
Receptors:	Army personnel (residential)
Exposure Pathway:	Groundwater ingestion, dermal contact, inhalation of VOCs
Ecological Risk:	None

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**Table A3-4 Decision Document Summary
Component: Remedial Action
Operable Unit 2 - Former Building 1168 Leach Well**

Decision Document Title:	Record of Decision for Operable Unit 2 Fort Wainwright Fairbanks, Alaska, January 1997
Remedy Chosen:	Alternative 3: Soil Vapor Extraction, Groundwater Air Sparging, and Monitoring
Remedial Action Objectives (RAOs):	The goal of the remedial action is to restore groundwater to its beneficial use as a drinking water aquifer and to remediate soil to State of Alaska clean-up levels for non- underground storage tank (UST) petroleum contaminated soil. <u>Groundwater</u>: • Restore groundwater to its beneficial use of drinking water quality within a reasonable time frame through source control • Reduce or prevent further migration of contaminated groundwater from the source areas • Prevent the use of groundwater containing contaminants at levels above Safe Drinking Water Act (SDWA) and AWQS • Using natural attenuation to attain AWQS (18 AAC 70) after reaching state and Federal MCLs <u>Soil</u>: • Prevent the migration of soil contaminants to groundwater, which could result in groundwater contamination and exceedances of state and Federal MCLs and AWQS (18 AAC 70). The ROD stated *“because soils contaminated with VOCs and petroleum-related compounds are acting as a continuing source of contamination to groundwater, the remedial action goal for in-situ soils is active remediation until contamination levels in groundwater are consistently below state and federal MCLs.”*
Clean-Up Goals:	Clean-up goals were based on Federal and state ARARs. <u>Groundwater</u>: Federal and State of Alaska drinking water MCLs for benzene, TCE, PCE, vinyl chloride, 1,1-DCE, and cis-1,2-DCE at the former Building 1168 Leach Well source area <u>Soil</u>: The ROD stated that *“because soils contaminated with VOCs and petroleum-related compounds are acting as a continuing source of contamination to groundwater, the remedial action goal for in-situ soils is active remediation until contamination levels in groundwater are consistently below state and federal MCLs.”* The State of Alaska cleanup levels for non-UST petroleum contaminated soil were considered as a guideline for the treatment of in-situ soils at the former Building 1168 Leach Well source area. Table 7-2 of the ROD adopted Alaska Department of Environmental Conservation (ADEC) soil cleanup matrix Level A cleanup goals for DRO, gasoline range organics (GRO), benzene, and total benzene, toluene, ethylbenzene, and xylenes at this source area.

Table A3-4 Decision Document Summary
Component: Remedial Action
Operable Unit 2 - Former Building 1168 Leach Well

Applicable or Relevant and Appropriate Requirements:	• State and Federal MCLs – relevant and appropriate for groundwater • Alaska Water Quality Standards – applicable • Alaska Oil Pollution Regulations – applicable • Alaska Guidelines for Non-UST Petroleum Contaminated Soil – to be considered
Components of the Remedy:	SVE/AS: • In-situ treatment of groundwater by AS to remove VOCs, thereby attaining state and Federal drinking water standards • In-situ treatment of soil by SVE to prevent contaminated soil from acting as an ongoing source of contamination to groundwater • Treatment system evaluation and modification as necessary to optimize effectiveness • Periodic monitoring and evaluation of air emissions from the SVE/AS system to meet air emission requirements • Periodic groundwater monitoring and off-gas measurements to determine attainment of RAOs MNA/long-term monitoring: Achieve the AWQS through natural attenuation after active treatment attains state and Federal MCLs ICs: Restrict site access and restrict well installation and development activities as long as hazardous substances remain on site at levels that preclude unrestricted use

Table A3-5 Decision Document Summary
Component: Background/Basis for Taking Action
Operable Unit 2 - DRMO Yard

Decision Document Title:	Record of Decision for Operable Unit 2 Fort Wainwright Fairbanks, Alaska, January 1997
Regulatory Framework:	CERCLA NPL
Remedy Chosen:	Alternative 3: Soil Vapor Extraction, Groundwater Air Sparging, and Monitoring.
Media of Concern:	Groundwater
Contaminants of Concern (COCs):	Groundwater: Benzene, tetrachloroethene (PCE), TCE, vinyl chloride, 1,1-DCE, and cis-1,2-DCE
Land Use:	Current: industrial; residential for groundwater Future: industrial; residential for groundwater
Receptors:	Army personnel (residential)
Exposure Pathway:	Groundwater ingestion, dermal contact, inhalation of VOCs
Ecological Risk:	The results of the Ecological Risk Assessment for OU-2 indicate a potential for adverse effects to small terrestrial mammals (e.g., voles) at the DRMO Yard, reflecting ecologically significant concentrations of manganese and lead. These risks are associated with ingestion of soil and vegetation. These contaminants do not appear to be associated with historical source area activities and are consistent with regional background concentrations. Overall, there do not appear to be unacceptable potential ecological risks associated with the DRMO Yard source area.

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Table A3-6 Decision Document Summary
Component: Remedial Action
Operable Unit 2 - DRMO Yard

Decision Document Title:	Record of Decision for Operable Unit 2 Fort Wainwright Fairbanks, Alaska, January 1997
Remedy Chosen:	Alternative 3: Soil Vapor Extraction, Groundwater Air Sparging, and Monitoring.
Remedial Action Objectives (RAOs):	The goal of the remedial action is to restore groundwater to its beneficial use as a drinking water aquifer and to remediate soil to State of Alaska cleanup levels for non-UST petroleum contaminated soil. <u>Groundwater</u>: • Restore groundwater to its beneficial use of drinking water quality within a reasonable time frame through source control • Reduce or prevent further migration of contaminated groundwater from the source areas • Prevent use of groundwater containing contaminants at levels above SWDA and State of Alaska Drinking Water Standard MCLs and AWQS • Use natural attenuation to attain AWQS (18 AAC 70) after reaching state and Federal MCLs <u>Soil</u>: • Prevent migration of soil contaminants to groundwater, which could result in groundwater contamination and exceedances of state and Federal MCLs and AWQS (18 AAC 70)
Clean-Up Goals:	<u>Groundwater</u>: Federal and State of Alaska drinking water MCLs were adopted as cleanup goals for benzene, PCE, TCE, vinyl chloride, 1,1-DCE, and cis-1,2-DCE at the DRMO Yard source area. <u>Soil</u>: ADEC soil cleanup matrix cleanup levels were adopted as preliminary remediation goals for DRO in the DRMO Yard source area.
Applicable or Relevant and Appropriate Requirements:	• Federal Safe Drinking Water Act (40 CFR 141) and Alaska Drinking Water Regulations (18 AAC 80): The MCL and non-zero MCL goals were established under the SDWA and are relevant and appropriate for groundwater that is a potential drinking water source. • AWQS (18 AAC 70): Alaska Water Quality Standards for Protection of Class (l)(A) Water Supply, Class (l)(R) Water Recreation, and Class (1) Aquatic Life and Wildlife (18 AAC 70) are applicable to both source areas. Many of the constituents of groundwater regulated by AWQS are identical to MCLs in Drinking Water Standards. • Alaska Oil Pollution Regulations (18 AAC 75): Alaska Oil Pollution Control Regulations, are applicable. Under these regulations, responsible parties are required to clean up oil or hazardous material releases. The Army anticipates achieving a cleanup level consistent with this regulation. • Alaska Regulations for Leaking Underground Storage Tanks (18 AAC 78):

Table A3-6 Decision Document Summary
Component: Remedial Action
Operable Unit 2 - DRMO Yard

	The State of Alaska has established cleanup requirements for petroleum-contaminated soils from leaking USTs to protect groundwater and are relevant and appropriate for the DRMO Yard.
Components of the Remedy:	The remedial action components specified for the DRMO source area included: SVE/AS: • In-situ treatment of groundwater via AS to remove VOCs • In-situ treatment of soil via SVE to prevent contaminated soil from acting as an ongoing source of contamination to groundwater • Treatment system evaluation and modification as necessary to optimize effectiveness • Periodic monitoring and evaluation of air emissions from the AS/SVE system to meet air emission requirements • Periodic groundwater monitoring and off-gas measurements to determine attainment of RAOs MNA/long-term monitoring: Achieve the AWQS through natural attenuation after active treatment attains state and federal MCLs. ICs: Restrict site access and restrict well installation and development activities as long as hazardous substances remain on site at levels that preclude unrestricted use.

Table A3-7 Decision Document Summary
Component: Background/Basis for Taking Action
Operable Unit 3 - Remedial Area 1B Birch Hill Tank Farm

Decision Document Title:	Record of Decision for Operable Unit 3 Fort Wainwright Fairbanks, Alaska, January 1996 Explanation of Significant Differences Operable Unit 3 Fort Wainwright Fairbanks, Alaska, September 2002
Regulatory Framework:	CERCLA NPL
Remedy Chosen:	Alternative 5 - soil vapor extraction and air sparging of groundwater.
Media of Concern:	Groundwater
Contaminants of Concern (COCs):	Groundwater: Benzene, toluene, ethylbenzene, 1,2-dibromoethane (EDB), 1,2 dichloroethane (DCA), 1,2,4-trimethylbenzene (TMB), and 1,3,5-TMB
Land Use:	Current: industrial; surrounding areas are industrial, recreational and residential Future: industrial; surrounding areas will be industrial, recreational and residential
Receptors:	Army personnel (residential), downgradient users (two churches), and users of the Class A municipal drinking water wells
Exposure Pathway:	Ingestion, inhalation
Ecological Risk:	Results of the Ecological Risk Assessment (ERA) did indicate potential effects to wildlife because of 5 COCs at the Tank Farm: 1) lead, 2) 1,2,4- TMB, 3) 1,3,5-TMB, 4) isopropylbenzene, and 5) toluene. Lead posed potential risks to all terrestrial biota except the red fox, while the other four contaminants posed potential risks only to the red squirrel and marten, which are unlikely to inhabit the Tank Farm Source Area. Consequently, the only potentially significant risks at OU-3 are because of wildlife exposure to lead in soils at the Tank Farm. However, given the conservative nature of the ERA, these potential risks are likely to be overestimated. (pg 83)

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Table A3-8 Decision Document Summary
Component: Remedial Action
Operable Unit 3 - Remedial Area 1B Birch Hill Tank Farm

Decision Document Title:	Record of Decision for Operable Unit 3 Fort Wainwright Fairbanks, Alaska, January 1996 Explanation of Significant Differences Operable Unit 3 Fort Wainwright Fairbanks, Alaska, September 2002
Remedy Chosen:	Alternative 5 - soil vapor extraction and air sparging of groundwater.
Remedial Action Objectives (RAOs):	<u>Groundwater</u>: • Restore groundwater to drinking water quality within a reasonable time frame • Reduce further migration of contaminated groundwater • Prevent use of groundwater with contaminants at levels above SDWA levels <u>Soil</u>: • Prevent the migration of contaminants from soil into groundwater that would result in groundwater contamination and exceedance of SDWA standards
Clean-Up Goals:	<u>Groundwater</u>: • Federal and State of Alaska drinking water MCLs were adopted as groundwater cleanup goals for benzene, toluene, ethylbenzene, EDB, and DCA • The concentrations corresponding to an excess cancer risk-based level of $1x10^{-4}$ were adopted as the cleanup goals for 1,2,4-TMB and 1,3,5-TMB because there were no MCLs for these contaminants • Although the ROD did not identify specific groundwater cleanup goals for petroleum hydrocarbons, the AWQS and other applicable Alaska environmental regulations are referenced as ARARs. The ROD stated that active remediation would be used to achieve SDWA levels and that natural attenuation would be used to achieve AWQS and other State of Alaska groundwater cleanup levels including DRO and GRO concentrations. <u>Soil</u>: • The remedial action goal for *in-situ* soils contaminated with VOCs and petroleum compounds is protection of groundwater. The ROD stated that since soils are acting as a continuing source of contamination to the groundwater, active remediation of the soils will continue until SDWA levels are consistently met. AWQS will be achieved through natural attenuation. The ROD also stated that petroleum-contaminated soils that are treated *ex-situ* will be treated to State of Alaska Matrix Level A standards before they are returned to the source area.

**Table A3-8 Decision Document Summary
Component: Remedial Action
Operable Unit 3 - Remedial Area 1B Birch Hill Tank Farm**

Applicable or Relevant and Appropriate Requirements:	• Federal and State of Alaska MCLs – relevant and appropriate for groundwater • Alaska Water Quality Standards – applicable • Alaska Oil Pollution regulations – applicable • Alaska regulations for leaking USTs – relevant and appropriate.
Components of the Remedy:	• AS/SVE: SVE of petroleum-contaminated soil and AS of petroleum-contaminated groundwater in permafrost-free areas at known contaminant sources and at locations where remedial action goals were exceeded to achieve SDWA levels. • Product recovery: During the summer and fall of 2000 a product recovery system was installed on Birch Hill. This sub-area was not a part of the OU3 ROD, but was established as part of an Explanation of Significant Differences (ESD). The ESD also required the implementation of groundwater modeling. • MNA/long-term monitoring: long term groundwater monitoring and natural attenuation to meet the AWQS. • ICs: restrict access and restrict development at the site as long as hazardous substances remain at concentrations above the remedial action goals. The development restrictions apply to construction and well development or placement as long as hazardous substances remain on site at levels that preclude unrestricted use, excluding activities undertaken to initiate the remedial actions.

Table A3-9 Decision Document Summary
Component: Background/Basis for Taking Action
Operable Unit 3 - Remedial Area 2 Valve Pits and ROLF

Decision Document Title:	Record of Decision for Operable Unit 3 Fort Wainwright Fairbanks, Alaska, January 1996 Explanation of Significant Differences Operable Unit 3 Fort Wainwright Fairbanks, Alaska, September 2002
Regulatory Framework:	CERCLA NPL
Remedy Chosen:	Alternative 5 - soil vapor extraction and air sparging of groundwater.
Media of Concern:	Groundwater
Contaminants of Concern (COCs):	Groundwater: Benzene, toluene, ethylbenzene, 1,2-EDB, 1,2-DCA, 1,2,4-TMB, and 1,3,5-TMB
Land Use:	Current: recreational and residential Future: recreational and residential
Receptors:	Army personnel (residential)
Exposure Pathway:	Ingestion
Ecological Risk:	None

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Table A3-10 Decision Document Summary
Component: Remedial Action
Operable Unit 3 - Remedial Area 2 Valve Pits and ROLF

Decision Document Title:	Record of Decision for Operable Unit 3 Fort Wainwright Fairbanks, Alaska, January 1996 Explanation of Significant Differences Operable Unit 3 Fort Wainwright Fairbanks, Alaska, September 2002
Remedy Chosen:	Alternative 5 - soil vapor extraction and air sparging of groundwater.
Remedial Action Objectives (RAOs):	Groundwater: • Restore groundwater to drinking water quality within a reasonable time frame • Reduce further migration of contaminated groundwater • Prevent the use of groundwater with contaminants above SDWA levels Soil: • For petroleum-contaminated soil, prevent migration of contaminants from soil into groundwater that would result in groundwater contamination and exceedance of SDWA standards
Clean-Up Goals:	Groundwater: • Federal and State of Alaska drinking water MCLs were adopted as groundwater cleanup goals for benzene, toluene, ethylbenzene, EDB, and 1,2-DCA • The remedial goals for 1,2,4-TMB and 1,3,5-TMB were based on a risk-based concentration equivalent to a non-cancer hazard quotient of 1 using a residential groundwater exposure assumption, since there were no MCLs for these contaminants. The values established in the ROD were erroneously selected from the wrong column in the Region 3 RBC tables. The values listed in the ROD for these chemicals correspond to an inhalation pathway. The residential groundwater assumptions in the remedial investigation/feasibility study (RI/FS) correspond to a remedial goal of 1.85 milligrams per liter (mg/L) for both compounds. This issue was discussed in the ESD. • Although the ROD did not identify specific groundwater cleanup goals for petroleum hydrocarbons, the AWQS and other applicable Alaska environmental regulations are referenced as ARARs. The ROD stated that active remediation would be used to achieve safe drinking water. Soil: • The remedial action goal for in-situ soil contaminated with VOC and petroleum compounds is based on the protection of groundwater. Because soils are acting as a continuing source of

**Table A3-10 Decision Document Summary
Component: Remedial Action
Operable Unit 3 - Remedial Area 2 Valve Pits and ROLF**

	contamination to the groundwater, active remediation of the soils will continue until SDWA levels are consistently met. Natural attenuation will continue until AWQS are achieved. • Petroleum contaminated soils that are treated ex-situ will meet State of Alaska Matrix Level A standards before they are returned to the source area • No source specific cleanup goals were established for Remedial Area 2
Applicable or Relevant and Appropriate Requirements:	• Federal and State of Alaska MCLs – relevant and appropriate for groundwater • Alaska Water Quality Standards – applicable • Alaska Oil Pollution regulations – applicable • Alaska regulations for leaking USTs – relevant and appropriate
Components of the Remedy:	AS/SVE: AS of petroleum-contaminated groundwater and SVE of petroleum-contaminated soil at known contaminant sources and at locations where remedial action goals were exceeded (i.e., hot spots) to achieve SDWA levels. MNA/long-term monitoring: long term groundwater monitoring and natural attenuation to meet the AWQS. ICs: restrict site access, restrict construction at the site, and restrict water supply well installation as long as hazardous substances remain at levels that preclude unrestricted use

Table A3-11 Decision Document Summary
Component: Background/Basis for Taking Action
Operable Unit 3 - Remedial Area 3 FEP Mileposts 2.7, 3.0 and 15.75

Decision Document Title:	Record of Decision for Operable Unit 3 Fort Wainwright Fairbanks, Alaska, January 1996 Explanation of Significant Differences Operable Unit 3 Fort Wainwright Fairbanks, Alaska, September 2002
Regulatory Framework:	CERCLA NPL
Remedy Chosen:	Alternative 5 - soil vapor extraction and air sparging of groundwater.
Media of Concern:	Groundwater
Contaminants of Concern (COCs):	Groundwater: Benzene, toluene, ethylbenzene, 1,2-EDB, 1,2-DCA, 1,2,4-TMB, and 1,3,5-TMB
Land Use:	Current: recreational and residential Future: recreational and residential
Receptors:	Army personnel
Exposure Pathway:	Ingestion
Ecological Risk:	None

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Table A3-12 Decision Document Summary
Component: Remedial Action
Operable Unit 3 - Remedial Area 3 FEP Mileposts 2.7, 3.0 and 15.75

Decision Document Title:	Record of Decision for Operable Unit 3 Fort Wainwright Fairbanks, Alaska, January 1996 Explanation of Significant Differences Operable Unit 3 Fort Wainwright Fairbanks, Alaska, September 2002
Remedy Chosen:	Alternative 5 - soil vapor extraction and air sparging of groundwater.
Remedial Action Objectives (RAOs):	The RAOs are generic for all source areas in OU3. Groundwater: • Restore groundwater to drinking water quality within a reasonable time frame • Reduce further migration of contaminated groundwater • Prevent use of groundwater with contaminants at levels above SDWA levels Soil: • For petroleum-contaminated soil, prevent migration of contaminants from soil into groundwater that would result in groundwater contamination and exceedance of SDWA standards.
Clean-Up Goals:	Based on the results of the baseline risk assessment for current (at the time of the ROD) and projected land use at the site, COCs were identified for establishing numeric cleanup goals for OU3. There were no source specific cleanup goals for Remedial Area 3. The ROD described the point of compliance for achieving the RAOs as wells downgradient of Remedial Area 3. Groundwater: • Federal and State of Alaska drinking water MCLs were adopted as groundwater cleanup goals for benzene, toluene, ethylbenzene, EDB, and 1,2-DCA • In the ROD, the remedial goals for 1,2,4-TMB and 1,3,5-TMB were based on a risk-based equivalent to a non-cancer hazard quotient of 1 using a residential groundwater exposure assumption, since there were no MCLs for these contaminants. However, the values established in the ROD were erroneously selected from the wrong column in the Region 3 RBC tables. The values listed in the ROD for these chemicals correspond to an inhalation pathway. The residential groundwater assumptions in the RI/FS correspond to a remedial goal of 1.85 mg/L for both compounds. This issue was discussed in the ESD. Soil: • The remedial action goal for in-situ soil contaminated with VOC and petroleum compounds is protection of groundwater. Because the soils are

Table A3-12 Decision Document Summary
Component: Remedial Action
Operable Unit 3 - Remedial Area 3 FEP Mileposts 2.7, 3.0 and 15.75

	acting as a continuing source of contamination to the groundwater, active remediation of the soils will continue until SDWA levels are consistently met. Natural attenuation will continue until AWQS are achieved. • Petroleum contaminated soils that are treated ex-situ will be treated to State of Alaska Matrix Level A standards before they are returned to the source area.
Applicable or Relevant and Appropriate Requirements:	• Federal and State of Alaska MCLs – Relevant and appropriate for groundwater • Alaska Water Quality Standards – Applicable • Alaska Oil Pollution regulations – Applicable • Alaska regulations for leaking USTs – Relevant and appropriate
Components of the Remedy:	AS/SVE: of contaminated soil and groundwater in permafrost-free areas. Long-term monitoring: The ROD also specified that long-term groundwater monitoring would be conducted at the three sites to ensure that contaminant concentrations were reduced in nearby wetlands. In addition, ICs would be maintained to restrict access to and development at the sites as long as hazardous substances remain onsite at levels that precluded unrestricted use. ESD: the following actions/changes that were not anticipated at the time of the ROD, but are required pursuant to the ESD. Many of these actions were completed prior to development of the ESD: • Excavation of contaminated soils from Milepost 2.7 (1,500 cubic yards) and Milepost 3.0 (6,000 cubic yards) and treatment in the vicinity of the Truck Fill Stand and Building 1173 treatment systems. • Treatment of contaminated soil from Milepost sites 2.7 and 3.0 in treatment cells to achieve ADEC Level A cleanup levels and soil disposal criteria required for placement in Fort Wainwright's on-Post solid waste landfill or to achieve applicable off-Post soil disposal criteria, as determined appropriate by the Army. • Monitoring of soil and groundwater contamination remaining in the vicinity of Remedial Area 3, for as long as required until RAOs have been achieved, as determined by concurrence of the project managers. Installation of additional monitoring wells and site characterization at Milepost 2.7 and 3.0 to gain a better understanding of local hydrology, impacts of permafrost, and contaminant migration.

Table A3-13 Decision Document Summary
Component: Background/Basis for Taking Action
Operable Unit 4 - Landfill

Decision Document Title:	Record of Decision for Operable Unit 4 Fort Wainwright Fairbanks, Alaska, August 1996
Regulatory Framework:	CERCLA NPL
Remedy Chosen:	**Alternative 3:** A phased approach involving capping of the soils in the older, inactive portion of the landfill, natural attenuation of groundwater; groundwater monitoring/evaluation; and institutional controls. Phase 2, if necessary, would involve evaluation and implementation of an active groundwater treatment system. (ROD Section 7.1, page 94 and Section 5.5.1.3, page 74)
Media of Concern:	Groundwater
Contaminants of Concern (COCs):	Benzene, cis-1,2-DCE, 1,1,2,2-Tetrachloroethane (PCA), 1,1,2-TCA, TCE, vinyl chloride, and bis(2-Ethylhexyl)phthalate
Land Use:	<u>Current</u>: industrial <u>Future</u>: industrial (ROD Section 4.0, page 40); residential for groundwater use (ROD Section 4.4, page 44)
Receptors:	Residential (groundwater use) (ROD Section 4.4, page 44 and Table 4-2)
Exposure Pathway:	Ingestion and dermal contact of groundwater, inhalation of indoor vapors that originate from groundwater (ROD Table 4-2)
Ecological Risk:	Insignificant per ROD Section 4.6.3.2, page 48: *"Barium poses potential risks to passerine birds (robins, sparrows, etc.) at the Landfill….through the ingestion of soil and earthworms. However, these locations represent a relatively small habitat area….the Landfill [is an] industrial area with a significant amount of heavy equipment and human activity. The habitat area in these locations has been significantly altered from the surrounding land. The actual number of animals that could be affected by these chemicals could be very low. No significant effects were predicted for waterfowl (mallards), raptors (kestrels), or terrestrial vegetation. No potential effects were predicted for aquatic species. There do not appear to be unacceptable potential ecological risks associated with the Landfill or CSY source areas."*

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Table A3-14 Decision Document Summary
Component: Remedial Action
Operable Unit 4 - Landfill

Decision Document Title:	Record of Decision for Operable Unit 4 Fort Wainwright Fairbanks, Alaska, August 1996
Remedy Chosen:	**Alternative 3:** A phased approach involving capping of the soils in the older, inactive portion of the landfill, natural attenuation of groundwater; groundwater monitoring/evaluation; and institutional controls. Phase 2, if necessary, would involve evaluation and implementation of an active groundwater treatment system. (ROD Section 7.1, page 94 and Section 5.5.1.3, page 74)
Remedial Action Objectives (RAOs):	• Restore groundwater to its beneficial use of drinking water quality within a reasonable timeframe • Reduce or prevent further migration of contaminated groundwater from the source areas • Prevent use of groundwater containing contaminants above Federal MCLs and AWQS (18 AAC 70) • Use natural attenuation to attain AWQS (18 AAC 70) (ROD Section 5.2.1, page 70)
Clean-Up Goals:	**Groundwater**: Federal and State of Alaska maximum contaminant levels (MCLs) for all COCs except 1,1,2,2-PCA; USEPA Region 3 Risk-Based Concentration (RBC) for 1,1,2,2-PCA. (ROD Table 5-1, page 82 and Table 7-1, page 97)
Applicable or Relevant and Appropriate Requirements:	**Chemical-specific:** • SDWA (40 CFR 141)and Alaska Drinking Water Regulation (18 AAC 80) • AWQS (18 AAC 70) for Protection of Class (1)(A) Water Supply, Class (1)(B) Water Recreation, and Class (1) Aquatic Life and Wildlife • Alaska Oil Pollution Regulation (18 AAC 75) • Alaska Solid Waste Management Regulations (18 AAC 60) **Location-specific:** • Clean Water Act Section 404 (40 CFR 230 and 33 CFR 320 – 330) **Action-specific** • RCRA Solid Waste Landfill Closure Criteria (40 CFR 258.60) • Federal Clean Air Act (42 USC 7401) (ROD Sections 8.22, 8.23, and 8.24, pages 101 – 102)

Table A3-14 Decision Document Summary
Component: Remedial Action
Operable Unit 4 - Landfill

Components of the Remedy:	**Landfill:** • Capping with a minimum of 2 feet of native soil of the approximately 8 acres of the inactive portion of the Landfill to achieve a permeability no greater than 10^{-5} centimeters per second • Maintain vegetative growth or grasses [on the cap] and promote natural drainage to prevent ponding and erosion **Contingent Remedy:** • The need for a gas collection system would be considered during remedial design. [The landfill cap remedial design did not include a methane gas collection system] • An active groundwater treatment system would be considered if natural attenuation of groundwater did not progress as projected (70 years to achieve the RAOs) or did not result in a significant reduction in leachate **Groundwater:** • Achieve the RAOs for this source area through natural attenuation • Monitor groundwater downgradient of the landfill and evaluate results to determine the effectiveness of the capping and natural attenuation with respect to the RAOs **Land Use Controls:** • Maintaining institutional controls restricting access to and development at the site as long as hazardous substances remain onsite at levels that precluded unrestricted use (ROD Section 7.1.1, page 94)

Table A3-15 Decision Document Summary
Component: Background/Basis for Taking Action
Operable Unit 4 – Coal Storage Yard

Decision Document Title:	Record of Decision for Operable Unit 4 Fort Wainwright Fairbanks, Alaska, August 1996
Regulatory Framework:	CERCLA NPL
Remedy Chosen:	**Alternative 6:** In situ treatment of soils via vacuum extraction enhanced by steam injection or bioventing, in situ treatment of groundwater via air sparging, groundwater monitoring/evaluation, and institutional controls (ROD Section 7.2, page 95 and Section 5.5.2.6, page 80)
Media of Concern:	Soil Groundwater
Contaminants of Concern (COCs):	<u>Soil:</u> Benzene, BTEX, DRO, GRO <u>Groundwater</u>: Benzene, bis(2-Ethylhexyl) phthalate, toluene, TCE
Land Use:	<u>Current</u>: industrial <u>Future</u>: industrial (ROD Section 4.0, page 40); residential for groundwater use (ROD Section 4.4, page 44)
Receptors:	Residential (groundwater use) (ROD Section 4.4, page 44 and Table 4-3)
Exposure Pathway:	Ingestion and dermal contact of groundwater, inhalation of indoor vapors that originate from groundwater (ROD Table 4-3)
Ecological Risk:	Insignificant per ROD Section 4.6.3.2, page 48: *"Barium and Copper pose a risk to passerine birds at the CSY through ingestion of soil and earthworms. However, these locations represent a relatively small habitat area….the CSY [is an] industrial area with a significant amount of heavy equipment and human activity. The habitat area in these locations has been significantly altered from the surrounding land. The actual number of animals that could be affected by these chemicals could be very low. No significant effects were predicted for waterfowl (mallards), raptors (kestrels), or terrestrial vegetation. No potential effects were predicted for aquatic species. There do not appear to be unacceptable potential ecological risks associated with the Landfill or CSY source areas."*

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**Table A3-16 Decision Document Summary
Component: Remedial Action
Operable Unit 4 – Coal Storage Yard**

Decision Document Title:	Record of Decision for Operable Unit 4 Fort Wainwright Fairbanks, Alaska, August 1996
Remedy Chosen:	**Alternative 6:** In situ treatment of soils via vacuum extraction enhanced by steam injection or bioventing, in situ treatment of groundwater via air sparging, groundwater monitoring/evaluation, and institutional controls (ROD Section 7.2, page 95 and Section 5.5.2.6, page 80)
Remedial Action Objectives (RAOs):	**Groundwater:** • Restore groundwater to its beneficial use of drinking water quality within a reasonable time frame • Reduce further migration of contaminated groundwater from the source areas • Prevent use of groundwater containing contaminants at levels above Federal MCLs and AWQS (18 AAC 70) • Use natural attenuation to attain AWQS (18 AAC 70) **Soil:** • Prevent migration of soil contaminants to groundwater that could result in groundwater contamination and exceedances of Federal MCLs and AWQS (18 AAC 70) (ROD Section 5.2.2, pages 70-71)
Clean-Up Goals:	**Groundwater**: Federal and State of Alaska MCLs (ROD Table 5-2, page 84 and Table 7-2, page 98) **Soil:** (ROD Table 5-2, page 85 and Table 7-2, page 99)
Applicable or Relevant and Appropriate Requirements:	**Chemical-specific:** • SDWA (40 CFR 141)and Alaska Drinking Water Regulation (18 AAC 80) • AWQS (18 AAC 70) for Protection of Class (1)(A) Water Supply, Class (1)(B) Water Recreation, and Class (1) Aquatic Life and Wildlife • Alaska Oil Pollution Regulation (18 AAC 75) • Alaska Regulations for Leaking Underground Storage Tanks (18 AAC 78) **Location-specific:** • Clean Water Act Section 404 (40 CFR 230 and 33 CFR 320 – 330) **Action-specific:** • Federal Clean Air Act (42 USC 7401) **To-be-considered:**

Table A3-16 Decision Document Summary
Component: Remedial Action
Operable Unit 4 – Coal Storage Yard

	• State of Alaska Guidance for Storage, Remediation, and Disposal of Non-UST Petroleum Contaminated Soils (July 29, 1991) • State of Alaska Interim Guidance for Surface and Groundwater Cleanup Levels (September 26, 1990) (ROD Sections 8.22, 8.23, and 8.24, pages 101 – 102)
Components of the Remedy:	**Soil and Groundwater:** • In situ treatment of soils via soil vapor extraction to prevent contaminated soils from acting as an ongoing source of contamination to groundwater. Soil vapor extraction wells will be placed in areas of the highest contamination and operated until groundwater MCLs are achieved • In situ treatment of groundwater via air sparging to remove VOCs, thereby attaining state and Federal drinking water standards. Air sparging wells will be placed in areas of highest contamination. • Evaluate and modify the treatment system as necessary to optimize effectiveness in achieving RAOs • Duration of treatment system operation is estimated to be nine years to meet ADEC soil cleanup goals and Federal MCLs. A combination of groundwater monitoring and off-gas measurements will be used to determine attainment of [the] RAOs • After active treatment achieves [the] MCLs, natural attenuation will be relied on to achieve [the] AWQS • Monitoring of nested downgradient wells to ensure protection of Post drinking water supply wells during remedial action **LUCs:** • Maintain institutional controls, including restricted access and well development restrictions, as long as hazardous substances remain on site at levels that preclude unrestricted use. Restrictions on groundwater will be implemented until contaminant levels are below Federal MCLs and [the] AWQS. (ROD Section 7.2.1, page 95)

**Table A3-17 Decision Document Summary
Component: Background/Basis for Taking Action
Operable Unit 5 - WQFS**

Decision Document Title:	Record of Decision for Operable Unit 5 Fort Wainwright Fairbanks, Alaska, May 1999
Regulatory Framework:	CERCLA NPL
Remedy Chosen:	Subarea WQFS1: Alternative 5: Alternative 4 with Operation of the Potential Downgradient Groundwater Air Sparging Trench. Subarea WQFS2: Alternative 3: Hot spot (source area) treatment with AS/SVE, continued operation of at downgradient groundwater AS curtain, groundwater monitoring, ICs, and MNA. Subarea WQFS3: Alternative 3: Hot spot (source area) treatment with AS/SVE, ICs, groundwater monitoring, and MNA.
Media of Concern:	WQFS: Groundwater, soil Chena River: surface water
Contaminants of Concern (COCs):	WQFS: Groundwater: 1,2-DCA, benzene, toluene, DRO, GRO, and RRO Soil: DRO, GRO, Benzene, Ethylbenzene, Toluene, Xylenes Surface Water: Total aromatic hydrocarbons (TAH) and total aqueous hydrocarbons (TaqH)
Land Use:	Current: industrial and recreational. Groundwater use: residential Future: industrial and recreational. Groundwater use: residential
Receptors:	Army personnel
Exposure Pathway:	Inhalation of dust, ingestion
Ecological Risk:	COPCs identified for ecological receptors are listed in Table 8 of the ROD. Mammalian indicator species selected for WQFS and EQFS include the meadow vole (exposure pathways include ingestion of plants and ingestion of soil) and the muskrat (exposure pathways include ingestion of aquatic plants, ingestion of sediment, and ingestion of surface water). Aquatic indicators selected for WQFS and EQFS include benthic invertebrates (exposure pathways include exposure to sediment and surface water). The post-wide ecological risk assessment identified the red fox as an indicator species to represent terrestrial receptors because it is omnivorous and, therefore, is more likely to bioaccumulate chemicals than herbivores whose diets consist of plants. Bioaccumulation factors for animals generally are higher than plant uptake.

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Table A3-18 Decision Document Summary
Component: Remedial Action
Operable Unit 5-WQFS

Decision Document Title:	Record of Decision for Operable Unit 5 Fort Wainwright Fairbanks, Alaska, May 1999
Remedy Chosen:	Subarea WQFS1: Alternative 5: Alternative 4 with Operation of the Potential Downgradient Groundwater Air Sparging Trench. Subarea WQFS2: Alternative 3: Hot spot (source area) treatment with AS/SVE, continued operation of at downgradient groundwater AS curtain, groundwater monitoring, ICs, and MNA. Subarea WQFS3: Alternative 3: Hot spot (source area) treatment with AS/SVE, ICs, groundwater monitoring, and MNA.
Remedial Action Objectives (RAOs):	Groundwater: • Restore groundwater to its beneficial uses within a reasonable time frame. Reduce or prevent further migration of contaminated groundwater from the source areas to the downgradient aquifer or surface water bodies that are closely hydrologically connected by achieving MCLs (where there are no nonzero maximum contaminant level goals [MCLGs]) and AWQS. For groundwater that is hydrologically connected to surface water, AWQS apply for the following Fresh Water Uses: (l)(A) Water Supply; (l)(B) Water Recreation; and (l)(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife. • Ensure there is no risk to aquatic receptors through control of contaminant movement through the groundwater into the Chena River. • Remove light non-aqueous phase liquid to the extent practicable to eliminate film or sheen from groundwater. • Prevent use of groundwater containing contaminants at levels above SDWA MCLs, non-zero MCLGs, or the following AWQS for Fresh Water Uses: (l)(A) Water Supply; (l)(B) Water Recreation; and (l)(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife. Soil: • Prevent the migration to groundwater of soil contaminants that could result in groundwater contamination and exceedances of Federal MCLs and nonzero MCLGs and to groundwater that is hydrogeologically connected to surface water (such as the Chena River) that could result in exceedances of AWQS in surface water. Chena River Sediments: • Reduce sources of contaminant releases to the Chena River Chena River Surface Water: • Meet AWQS for the following Fresh Water Uses: (1)(A) Water "J Supply; (1)(B) Water Recreation; and (1)(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife

Table A3-18 Decision Document Summary
Component: Remedial Action
Operable Unit 5-WQFS

	• Continue aquatic assessment based on the baseline risk assessment for projected land and resource use at the WQFS, the ROD adopted the following cleanup goals:
Clean-Up Goals:	<u>Groundwater</u>: • Federal and state MCLs for 1,2-DCA, benzene, and toluene, and State of Alaska (18 AAC 75) cleanup levels for GRO, DRO, and RRO were adopted as numeric cleanup goals for the WQFS. In addition, the ROD identified elimination of any sheen caused by floating petroleum product as a cleanup goal. • The cleanup level for GRO in groundwater as presented in Table C of ADEC 18 AAC 75 changed in 2008 from 1,300 micrograms per liter (µg/L) (as it was in 1999 at the time the ROD was signed) to 2,200 µg/L. • The cleanup goals for groundwater hydraulically connected to the Chena River are the AWQS for TAH and TaqH. <u>Soil</u>: • The cleanup goal for soil in the WQFS is active remediation of soils until contaminant levels in groundwater are consistently below state and federal cleanup levels. <u>Chena River Sediments</u>: • No concentrations of toxic substances or petroleum hydrocarbons and other contaminants in bottom sediments that cause deleterious effects to aquatic life, to be determined by a benthic macroinvertebrate assessment • Benthic macroinvertebrate assessment to establish baseline and to monitor aquatic biotic integrity through time <u>Chena River Surface Water</u>: • TAH and TaqH • Eliminate petroleum hydrocarbon sheen • Benthic macroinvertebrate assessment to establish baseline and to monitor aquatic biotic integrity over time • Groundwater monitoring to assess reduction of contaminant releases to the Chena River
Applicable or Relevant and Appropriate Requirements:	• Federal and state MCLs are relevant and appropriate for groundwater that is a potential drinking water source (40 CFR 141 and 18 AAC 80). These ARARs set the active remediation goals for groundwater; AWQS (18 AAC 70) are also applicable to surface water, sediment, and groundwater that is closely hydrologically connected to surface water. • Alaska oil pollution regulations (18 AAC 75) are applicable and require the cleanup of oil or hazardous material releases.

**Table A3-18 Decision Document Summary
Component: Remedial Action
Operable Unit 5-WQFS**

Components of the Remedy:	WQFS1: • AS/SVE to address solvent and petroleum contamination in the source-area soil and groundwater and floating-product. • In-situ heating at hot spots was proposed as a method to increase the rate of remediation. It would be used in the event that AS was ineffective in achieving progressive reduction of VOC and petroleum hydrocarbon concentrations in soils. • Groundwater monitoring during active system operation and after operations to assess for possible rebound of the COC concentrations. • MNA for deep groundwater and areas not being actively treated. • ICs to ensure that groundwater will not be used as a potable water source. Includes restrictions on site access, construction, and well development or placement. WQFS2: • AS/SVE to address solvent and petroleum contaminated hot spots and floating-product. • Continued operation of a downgradient sparge curtain. • Installing a harbor boom downgradient of the sparge curtain to control contaminant releases into the Chena River. • Pilot-scale operation of an oxygen release compound system • Groundwater monitoring to determine whether cleanup levels are achieved and maintained downgradient of the sparge curtain. The monitoring would be continued after system shut down to assess potential for rebound of the concentrations. • MNA for deep groundwater and areas not being actively treated within WQFS2 • ICs to ensure that groundwater will not be used as a potable water source. They include restrictions on site access, construction, and well development or placement. WQFS3: • AS/SVE to address solvent- and petroleum contaminated hot spots and floating-product. • ICs to ensure that groundwater will not be used except for activities undertaken to initiate the selected remedies detailed in the ROD. ICs include restrictions governing site access, on site construction, and well development or placement. • Groundwater monitoring to determine whether cleanup levels are achieved and maintained. Includes monitoring after system shut down to assess potential rebound of the concentrations. • MNA for deep groundwater and areas not being actively treated within WQFS3.

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**Table A3-19 Decision Document Summary
Component: Background/Basis for Taking Action
Operable Unit 5 – EQFS**

Decision Document Title:	Record of Decision for Operable Unit 5 Fort Wainwright Fairbanks, Alaska, May 1999
Regulatory Framework:	CERCLA NPL
Remedy Chosen:	Alternative 2 – Continued Operation of the Building 1060 SVE/AS Treatability Study System, Institutional Controls, and Monitored and Evaluated Natural Attenuation.
Media of Concern:	Groundwater Soil
Contaminants of Concern (COCs):	<u>Groundwater:</u> 1,2-DCA, toluene, TCE, 1,2-EDB, bis(2-Chloroethyl) ether, RRO, DRO <u>Soil:</u> DRO, GRO, Xylenes <u>Chena River Surface Waters:</u> TAH, TAqH
Land Use:	<u>Current</u>: industrial, groundwater: residential <u>Future</u>: industrial, groundwater: residential
Receptors:	Army personnel
Exposure Pathway:	Inhalation of dust, ingestion
Ecological Risk:	COPCs identified for ecological receptors are listed in Table 8 of the ROD. Mammalian indicator species selected for WQFS and EQFS include the meadow vole (exposure pathways include ingestion of plants and ingestion of soil) and the muskrat (exposure pathways include ingestion of aquatic plants, ingestion of sediment, and ingestion of surface water). Aquatic indicators selected for WQFS and EQFS include benthic invertebrates (exposure pathways include exposure to sediment and surface water). The post-wide ecological risk assessment identified the red fox as an indicator species to represent terrestrial receptors because it is omnivorous and, therefore, is more likely to bioaccumulate chemicals than herbivores whose diets consist of plants. Bioaccumulation factors for animals generally are higher than plant uptake factors for the same chemicals.

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Table A3-20 Decision Document Summary
Component: Remedial Action
Operable Unit 5– EQFS

Decision Document Title:	Record of Decision for Operable Unit 5 Fort Wainwright Fairbanks, Alaska, May 1999
Remedy Chosen:	Alternative 2 – Continued Operation of the Building 1060 SVE/AS Treatability Study System, Institutional Controls, and Monitored and Evaluated Natural Attenuation.
Remedial Action Objectives (RAOs):	Groundwater: • Restore groundwater to its beneficial uses within a reasonable time frame. Reduce or prevent further migration of contaminated groundwater from the source areas to the downgradient aquifer or surface water bodies that are closely hydrologically connected by achieving MCLs (where there are no nonzero MCLGs) and AWQS. For groundwater that is hydrologically connected to surface water, AWQS will apply for the following Fresh Water Uses: (l)(A) Water Supply; (l)(B) Water Recreation; and (l)(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife. • Ensure there is no risk to aquatic receptors through control of contaminant movement through the groundwater into the Chena River. • Remove light non-aqueous phase liquid (LNAPL) to the extent practicable to eliminate film or sheen from groundwater. • Prevent use of groundwater containing contaminants at levels above SDWA MCLs, nonzero MCLGs, or the following AWQS for Fresh Water Uses: (l)(A) Water Supply; (l)(B) Water Recreation; and (l)(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife. Soils: • Prevent the migration to groundwater of soil contaminants that could result in groundwater contamination and exceedances of Federal MCLs and nonzero MCLGs and to groundwater that is closely hydrogeologically connected to surface water (such as the Chena River) that could result in exceedances of AWQS in surface water (EQFS and WQFS). Chena River Sediments: • Reduce sources of contaminant releases to the Chena River. Chena River Surface Water: • Meet AWQS for the following fresh water uses: (1)(A) Water "J Supply; (1)(B) Water Recreation; and (1)(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife • Continue aquatic assessment.

Table A3-20 Decision Document Summary
Component: Remedial Action
Operable Unit 5– EQFS

Clean-Up Goals:	Groundwater: Federal and state MCLs for 1,2-DCA, toluene, TCE, EDB; the 10^{-6} residential risk value for bis(2-chloroethyl)ether; and State of Alaska (18 AAC 75) cleanup levels for DRO, and RRO for the EQFS. Elimination of any sheen caused by floating petroleum product (EQFS groundwater). Soil: The cleanup goal for soil in the EQFS is active remediation until contaminant levels in groundwater are consistently below state and federal MCLs. Chena River Sediments: • No concentrations of toxic substances or petroleum hydrocarbons and other contaminants in bottom sediments that cause deleterious effects to aquatic life, to be determined by a benthic macroinvertebrate assessment • Benthic macroinvertebrate assessment to establish baseline and to monitor aquatic biotic integrity through time Chena River Surface Water: • TAH and TAqH • Eliminate petroleum hydrocarbon sheen • Benthic macroinvertebrate assessment to establish baseline and to monitor aquatic biotic integrity over time • Groundwater monitoring to assess reduction of contaminant releases to the Chena River
Applicable or Relevant and Appropriate Requirements:	• Federal and state MCLs are relevant and appropriate for groundwater that is a potential drinking water source (40 CFR 141 and 18 AAC 80). These ARARs set the active remediation goals for groundwater. AWQS (18 AAC 70) are also applicable to surface water, sediment, and groundwater that is closely hydrologically connected to surface water. • Alaska oil pollution regulations (18 AAC 75) are applicable and require the cleanup of oil or hazardous material releases.
Components of the Remedy:	• Continued operation of a Building 1060 AS/SVE system to address solvent- and petroleum-contaminated hot spots and floating-product. • Groundwater monitoring during active system operation and after operation to assess for possible rebound of the COC concentrations. • MNA for deep groundwater and areas were not actively treated within the EQFS. • ICs to ensure that groundwater will not be used as a potable water source. Includes restrictions on site access, construction, and well development or placement.

**Table A3-21 Decision Document Summary
Component: Background/Basis for Taking Action
Operable Unit 5 – Remedial Area 1A Birch Hill Above Ground Storage Tanks**

Decision Document Title:	Record of Decision for Operable Unit 5 Fort Wainwright Fairbanks, Alaska, May 1999
Regulatory Framework:	CERCLA NPL
Remedy Chosen:	Alternative 2 – Institutional Controls
Media of Concern:	Soil, Groundwater, Surface Water
Contaminants of Concern (COCs):	Soil: Lead (2-party: petroleum hydrocarbons)
Land Use:	Current: industrial, residential (groundwater) Future: industrial, residential (groundwater)
Receptors:	Army personnel
Exposure Pathway:	Inhalation of dust, ingestion
Ecological Risk:	Potential risks from exposure to lead and petroleum hydrocarbons exist for all terrestrial receptors at Remedial Area 1A. However, the source area does not provide suitable habitat for any species because of the presence of existing facilities and human disturbance in the area. Potential receptors would be expected to avoid Remedial Area 1A and preferentially use habitat with less disturbance. Habitat outside the source areas has not been affected. Therefore, Remedial Area 1A is expected to constitute only a portion of the range of ecological receptors and a significant portion of their diet would be obtained from outside the source areas.

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Table A3-22 Decision Document Summary
Component: Remedial Action
Operable Unit 5– Remedial Area 1A Birch Hill Above Ground Storage Tanks

Decision Document Title:	Record of Decision for Operable Unit 5 Fort Wainwright Fairbanks, Alaska, May 1999
Remedy Chosen:	Alternative 2 – Institutional Controls
Remedial Action Objectives (RAOs):	Groundwater: • Restore groundwater to its beneficial uses within a reasonable time frame. Reduce or prevent further migration of contaminated groundwater from the source areas to the downgradient aquifer or surface water bodies that are closely hydrologically connected by achieving MCLs (where there are no nonzero MCLGs) and AWQS. For groundwater that is hydrologically connected to surface water, AWQS will apply for the following fresh water uses: (l)(A) Water Supply; (l)(B) Water Recreation; and (l)(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife. • Ensure there is no risk to aquatic receptors through control of contaminant movement through the groundwater into the Chena River. • Remove LNAPL to the extent practicable to eliminate film or sheen from groundwater. • Prevent use of groundwater containing contaminants at levels above SDWA MCLs, non-zero MCLGs, or the following AWQS for fresh water uses: (l)(A) Water Supply; (l)(B) Water Recreation; and (l)(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife. Soil: Prevent the migration to groundwater of soil contaminants that could result in groundwater contamination and exceedances of federal MCLs and nonzero MCLGs and to groundwater that is closely hydrogeologically connected to surface water (such as the Chena River) that could result in exceedances of AWQS in surface water. Limit human health and terrestrial receptor exposure to lead-contaminated soil. Chena River Sediments: • Reduce sources of contaminant releases to the Chena River Chena River Surface Water: • Meet the AWQS for the following fresh water uses: (1)(A) Water "J Supply; (1)(B) Water Recreation; and (1)(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife • Continue aquatic assessment.
Clean-Up Goals:	Soil: No direct contact for total lead concentration greater than 1,000 milligrams per kilogram (mg/kg)

Table A3-22 Decision Document Summary
Component: Remedial Action
Operable Unit 5– Remedial Area 1A Birch Hill Above Ground Storage Tanks

Applicable or Relevant and Appropriate Requirements:	There are no specific ARARs for Remedial Area 1a. To Be Considered (TBC) information for Remedial Area 1a: addressing interim lead soil guidance and preliminary remediation goals is included in the ROD.
Components of the Remedy:	ICs, which include land use restrictions, signage, and maintaining an existing fence.

**Table A3-23 Decision Document Summary
Component: Background/Basis for Taking Action
Operable Unit 5 – Open Burning/Open Detonation (OB/OD) Area**

Decision Document Title:	Record of Decision for Operable Unit 5 Fort Wainwright Fairbanks, Alaska, May 1999
Regulatory Framework:	CERCLA NPL
Remedy Chosen:	No Further Action/Institutional Controls (monitoring and control of access to the site)
Media of Concern:	N/A - UXO
Contaminants of Concern (COCs):	N/A - UXO
Land Use:	Current/Future: Active small arms impact range
Receptors:	Army personnel
Exposure Pathway:	N/A - UXO
Ecological Risk:	N/A - UXO

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**Table A3-24 Decision Document Summary
Component: Remedial Action
Operable Unit 5– OB/OD Area**

Decision Document Title:	Record of Decision for Operable Unit 5 Fort Wainwright Fairbanks, Alaska, May 1999
Remedy Chosen:	No Further Action/Institutional Controls (monitoring and control of access to the site)
Remedial Action Objectives (RAOs):	N/A
Clean-Up Goals:	N/A
Applicable or Relevant and Appropriate Requirements:	Interim status standards: 40 CFR 265 Closure plan and post-closure plan: 1991 FFCA Subject to RCRA permit
Components of the Remedy:	Monitor and control access, restrict land use

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Table A3-25 Decision Document Summary
Component: Background/Basis for Taking Action
Operable Unit 6 – Former Communications Site

Decision Document Title:	Record of Decision Operable Unit 6 Former Communications Site Fort Wainwright, Alaska, January 2014
Regulatory Framework:	CERCLA NPL
Remedy Chosen:	Alternative S2: Institutional Controls to Restrict Excavation of Soil Alternative GW2: Monitored Natural Attenuation and Institutional Controls to Prohibit Groundwater Use
Media of Concern:	Soil and groundwater
Contaminants of Concern (COCs):	Soil: 1,2,3-trichloropropane (TCP), DRO, aluminum, copper, and manganese Groundwater: TCE, 1,2,3-TCP, DRO, and RRO
Land Use:	Current: Residential (housing units are currently unoccupied) Future: Residential
Receptors:	Residential (hypothetical, unrestricted)
Exposure Pathways:	Direct contact with soil, inhalation of VOCs (indoor air), and groundwater ingestion
Ecological Risk:	*"Chemicals of potential ecological concern occurring in the drainage swale and groundwater is considered to be low."* (ROD, Section 2.7.2, page 120)

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**Table A3-26 Decision Document Summary
Component: Remedial Action
Operable Unit 6 – Former Communications Site**

Decision Document Title:	Record of Decision Operable Unit 6 Former Communications Site Fort Wainwright, Alaska, January 2014
Remedy Chosen:	Alternative S2: Institutional Controls to Restrict Excavation of Soil Alternative GW2: Monitored Natural Attenuation and Institutional Controls to Prohibit Groundwater Use
Remedial Action Objectives (RAOs):	Soil: • Protect against human exposure to COCs in soil. This RAO will be achieved if soil containing COCs at concentrations exceeding PCLs is managed through administrative processes, or if COCs in soil are reduced to meet PCLs. Groundwater: • Protect against human exposure to COCs in groundwater. This RAO will be attained if the exposure pathway to human receptors is limited or eliminated through administrative processes, or if COC concentrations in groundwater are reduced to meet PCLs. • Return groundwater to its beneficial use as a drinking water source. VOCs are expected to reach PCLs within 25 years; it is expected that remediation of DRO and RRO will take longer. This RAO will be achieved when groundwater COCs are below PCLs.
Clean-Up Goals:	Soil: ADEC risk-based cleanup levels and USEPA risk-based screening levels. 1,2,3-TCP 0.17 mg/kg DRO 10,250 mg/kg Aluminum 77,000 mg/kg Copper 4,160 mg/kg Manganese 1,800 mg/kg Groundwater: Federal and State of Alaska drinking water MCLs. 1,2,3-TCP 0.12 µg/L DRO 1,500 µg/L RRO 1,100 µg/L TCE 5 µg/L
Applicable or Relevant and Appropriate Requirements:	Federal and State of Alaska MCLs: • 40 CFR Part 141 • 18 AAC 75.345 • 18 AAC 75.360 • 18 AAC 75.375©

Table A3-26 Decision Document Summary
Component: Remedial Action
Operable Unit 6 – Former Communications Site

Components of the Remedy:	• Institutional controls to restrict excavation of soil. • Monitored natural attenuation and institutional controls to prohibit groundwater use.

ATTACHMENT 4

Site Inspection Checklists

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Five-Year Review Site Inspection Checklist
Fort Wainwright OU-1

I. SITE INFORMATION

Site name: OU-1 801 Drum Burial Site	**Date of inspection:** 11 August 2015
Location and Region: Fairbanks, Alaska	**EPA ID:** AK6210022426
Agency, office, or company leading the five-year review: US Army Corps of Engineers, Buffalo District	**Weather/temperature:** Overcast/55-65ºC±

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
☐ Access controls
☒ Institutional controls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☒ Other Drum removal
☒ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls

A groundwater contingent remedy was selected including AS/SVE but was not implemented

Inspection team roster:

Mr. Brian Adams, Fort Wainwright Restoration Project Manager

Dr. Karen Keil, USACE Buffalo Risk Assessor

Ms. Holly Akers, PE, USACE Buffalo Project Engineer

Attachments: ☒ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Joseph Malen (Name) Restoration Program Manager (Title) 10-13 August 2015 (Date)
   Interviewed ☒ at site ☒ at office ☐ by phone Phone no. (907) 361-4512
   Problems, suggestions; ☒ Report attached See interview form

2. **O&M staff** Brian Adams (Name) Restoration Project Manager (Title) 10-13 August 2015 (Date)
   Interviewed ☒ at site ☒ at office ☐ by phone Phone no. ________
   Problems, suggestions; ☒ Report attached See interview form

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

   Agency USEPA
   Contact Sandra Halstead (Name) Federal Facilities RPM (Title) ________ (Date) (907) 271-1218 (Phone no.)
   Problems; suggestions; ☐ Report attached Not present

   Agency ADEM
   Contact Dennis Sheppard (Name) ADEC RPM (Title) ________ (Date) ________ (Phone no.)
   Problems; suggestions; ☐ Report attached Not present

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-1

4.	**Other interviews** (optional) ☒ Reports attached. (See interview forms)			
Bob Hazlett, Environmental Scientist (USACE Alaska)				
III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	**O&M Documents**			
	☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
	☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
	☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A
	Remarks:			
2.	**Site-Specific Health and Safety Plan**	☒ Readily available	☒ Up to date	☐ N/A
	☒ Contingency plan/emergency response plan	☒ Readily available	☒ Up to date	☐ N/A
	Remarks: The Site-Specific Health and Safety Plan was drafted and implemented by the contractor, FES.			
3.	**O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: O&M and OSHA training records are maintained by contractors working on Fort Wainwright.			
4.	**Permits and Service Agreements**			
	☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
	☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
	☐ Other permits____________________	☐ Readily available	☐ Up to date	☒ N/A
	Remarks:			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks:			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks :			
7.	**Groundwater Monitoring Records**	☒ Readily available	☒ Up to date	☐ N/A
	Remarks:			
8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks_			
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	☒ N/A
	☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A
	Remarks:			
10.	**Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: Access and security are controlled at the installation access points.			

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-1

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☒ Federal Facility in-house ☒ Contractor for Federal Facility
☐ Other:

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Contractor-performed inspections & reporting
Frequency At least annually
Responsible party/agency Federal facility

Contact	Joseph Malen	Restoration Program Manager	10-12 August 2015	(907) 361-4512
	Name	Title	Date	Phone no.

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Violations have been reported ☒ Yes ☐ No ☐ N/A
Other problems or suggestions: ☐ Report attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: Not applicable.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A

Remarks: Access is controlled by installation fencing (not site-specific).

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks: Signage is present along installation fencing.

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-1

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Contractor-performed inspections & reporting
Frequency At least annually
Responsible party/agency Federal facility

Contact	Name	Title	Date	Phone no.
	Joseph Malen	Restoration Program Manager	10-12 August 2015	(907) 361-4512

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Violations have been reported ☒ Yes ☐ No ☐ N/A
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks: Some debris (cardboard boxes, etc.) observed on site indicating site access is occurring.

2. **Land use changes on site** ☒ N/A
Remarks:

3. **Land use changes off site** ☒ N/A
Remarks:

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☒ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks:

B. Other Site Conditions

Remarks

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-1

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

C. Treatment System ☐ Applicable ☒ N/A

D. Monitoring Data ☒ Applicable ☐ N/A

1. Monitoring Data
   ☒ Is routinely submitted on time ☐ Is of acceptable quality

2. Monitoring data suggests:
   ☐ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining

E. Monitored Natural Attenuation ☒ Applicable ☐ N/A

1. **Monitoring Wells** (natural attenuation remedy)
   ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
   ☒ All required wells located ☐ Needs Maintenance ☐ N/A
   Remarks : ______________________________

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

Remarks : ______________________________

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy was established to: 1) ensure that groundwater contamination at the site meets federal and state standards, 2) minimize the potential for migration of contaminated groundwater to the Chena River and to downgradient drinking water wells, 3) establish and maintain ICs to ensure that groundwater will not be used until MCLs are arraigned, 4) prevent leaching of contaminants from soil to groundwater, and 5) reduce risks associated with exposure to contaminated soil and drums. The remedy was implemented, it consisted of: 1) locating and removing buried drums, establishing ICs to ensure that groundwater would not be used until MCLs are attained, 3) natural attenuation and long-term monitoring of groundwater, and 4) AS/SVE (contingent remedy) if the contaminant concentrations show an increasing trend over three consecutive sampling events and 2) data indicates that the groundwater contamination is attenuating, albeit at a slow rate, and the plumes are stable. The remedy is functioning as intended by the ROD.

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-1

B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. O&M consists of monitoring well inspections and maintenance (if necessary). All wells were found to be in satisfactory condition.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. No early indicators of potential remedy problems were identified.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. Opportunities for optimization were not identified.

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-2 Sites

I. SITE INFORMATION	
Site name: OU-2 1168 Leach Well and DRMO Yard	**Date of inspection:** 11 August 2015
Location and Region: Fairbanks, Alaska	**EPA ID:** AK6210022426
Agency, office, or company leading the five-year review: US Army Corps of Engineers, Buffalo District	**Weather/temperature:** Overcast/55-65ºC±

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
☐ Access controls
☒ Institutional controls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☒ Other Air sparge/soil vapor extraction formerly operated on this site
☒ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls

Inspection team roster:

Mr. Brian Adams, Fort Wainwright Restoration Project Manager

Dr. Karen Keil, USACE Buffalo Risk Assessor

Ms. Holly Akers, PE, USACE Buffalo Project Engineer

Attachments: ☒ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** — Joseph Malen (Name), Restoration Program Manager (Title), 10-12 August 2015 (Date)
   Interviewed ☒ at site ☒ at office ☐ by phone Phone no. (907) 361-4512
   Problems, suggestions; ☒ Report attached See interview form

2. **O&M staff** — Brian Adams (Name), Restoration Project Manager (Title), 10-12 August 2015 (Date)
   Interviewed ☒ at site ☒ at office ☐ by phone Phone no. ____________
   Problems, suggestions; ☒ Report attached See interview form

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

   Agency USEPA
   Contact Sandra Halstead (Name), Federal Facilities RPM (Title), ________ (Date), (907) 271-1218 (Phone no.)
   Problems; suggestions; ☐ Report attached Not present

   Agency ADEC
   Contact Dennis Sheppard (Name), ADEC RPM (Title), ________ (Date), ________ (Phone no.)
   Problems; suggestions; ☐ Report attached Not present

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-2 Sites

4. **Other interviews** (optional) ☒ Reports attached. (See interview forms)

Bob Hazlett, Environmental Scientist (USACE Alaska)

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______

2. **Site-Specific Health and Safety Plan** ☒ Readily available ☒ Up to date ☐ N/A

☒ Contingency plan/emergency response plan ☒ Readily available ☒ Up to date ☐ N/A

Remarks: The Site-Specific Health and Safety Plan was drafted and implemented by the contractor, FES.

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: O&M and OSHA training records are maintained by contractors working on Fort Wainwright.

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits______	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: ______

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks : ______

7. **Groundwater Monitoring Records** ☒ Readily available ☒ Up to date ☐ N/A

Remarks: ______

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______

9. **Discharge Compliance Records**

☐ Air	☐ Readily available	☐ Up to date	☒ N/A
☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: Access and security are controlled at the installation access points.

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-2 Sites

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☒ Federal Facility in-house ☒ Contractor for Federal Facility
☐ Other:____

2. **O&M Cost Records** (Not applicable)

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate: Not available ☐ Breakdown attached

Total annual cost by year for review period if available (not available)

From ________ (Date)	To ________ (Date)	________ (Total cost)	☐ Breakdown attached
From ________ (Date)	To ________ (Date)	________ (Total cost)	☐ Breakdown attached
From ________ (Date)	To ________ (Date)	________ (Total cost)	☐ Breakdown attached
From ________ (Date)	To ________ (Date)	________ (Total cost)	☐ Breakdown attached
From ________ (Date)	To ________ (Date)	________ (Total cost)	☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: Not applicable

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A

Remarks: Access is controlled by installation fencing (not site-specific).

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks: Signs present along installation fencing and portions of OU-2.

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-2 Sites

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Contractor-performed inspections & reporting
Frequency At least annually
Responsible party/agency Federal facility

Contact	Joseph Malen	Restoration Program Manager	10-12 August 2015	(907) 361-4512
	Name	Title	Date	Phone no.

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Violations have been reported ☒ Yes ☐ No ☐ N/A
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks

2. **Land use changes on site** ☒ N/A
Remarks:

3. **Land use changes off site** ☒ N/A
Remarks:

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks:

B. Other Site Conditions

Remarks

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-2 Sites

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

C. Treatment System ☐ Applicable ☒ N/A

D. Monitoring Data ☒ Applicable ☐ N/A

1. Monitoring Data
   ☒ Is routinely submitted on time ☒ Is of acceptable quality

2. Monitoring data suggests:
   ☒ Groundwater plumes are effectively contained ☒ Contaminant concentrations are declining

E. Monitored Natural Attenuation ☒ Applicable ☐ N/A

1. **Monitoring Wells** (natural attenuation remedy)
   ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
   ☒ All required wells located ☒ Needs Maintenance ☐ N/A
   Remarks : Monitoring wells in the vicinity of the DRMO yard observed damaged due to frost heaving.

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

Remarks : AS/SVE systems previously operated at each site and have been shut down.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedies for each site were established to: 1) restore groundwater to its beneficial use of drinking water quality within a reasonable time frame through source control, 2) reduce or prevent further migration of contaminants from source areas, 3) prevent the use of groundwater containing contaminants above MCLs, 4) use natural attenuation to attain Alaska Water Quality Standards after the MCLs are met, and 5) prevent the migration of soil contaminants to groundwater. The remedies were implemented and consisted of: 1) operating AS/SVE systems, 2) in-situ chemical oxidation (ISCO) (1168 Leach well site) and in-situ chemical reduction (DRMO Yard) treatability studies, 3) groundwater monitoring, and 4) implementing ICs. The remedies are functioning as intended by the ROD. At the Building 1168 Leach well site groundwater concentrations since the ISCO process indicate that COCs have consistently been below the cleanup goals. At the DRMO Yard, groundwater contamination plumes are stable or decreasing and PCE concentrations continue to exceed the MCL in several wells sampled. The remedial actions have prevented further migration of contaminated groundwater from source areas.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

O&M consists of monitoring well inspections and maintenance (if necessary) at each site.

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-2 Sites

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. No early indicators of potential remedy problems were identified.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. Opportunities for optimization were not identified.

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-3 Sites

I. SITE INFORMATION

Site name: OU-3 Remedial Areas 1B (Birch Hill Tank Farm), 2 (Valve Pits and ROLF), and 3 (FEP Mileposts 2.7 and 3.0)	**Date of inspection:** 11 August 2015
Location and Region: Fairbanks, Alaska	**EPA ID:** AK6210022426
Agency, office, or company leading the five-year review: US Army Corps of Engineers, Buffalo District	**Weather/temperature:** Overcast/55-65ºC±

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
☒ Monitored natural attenuation
☒ Access controls
☐ Groundwater containment
☒ Institutional controls
☐ Vertical barrier walls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☒ Other Formerly operated remedial systems include: 1) AS/SVE systems at Birch Hill Tank Farm, ROLF, and mile post signs 2.7 and 3.0 along the FEP, and 2) product recovery at Birch Hill.

Inspection team roster:

Mr. Brian Adams, Fort Wainwright Restoration Project Manager

Dr. Karen Keil, USACE Buffalo Risk Assessor

Ms. Holly Akers, PE, USACE Buffalo Project Engineer

Attachments: ☒ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** — Joseph Malen (Name) — Restoration Program Manager (Title) — 10-12 August 2015 (Date)
   Interviewed ☒ at site ☒ at office ☐ by phone Phone no. (907) 361-4512
   Problems, suggestions; ☒ Report attached See interview form

2. **O&M staff** — Brian Adams (Name) — Restoration Project Manager (Title) — 10-12 August 2015 (Date)
   Interviewed ☒ at site ☒ at office ☐ by phone Phone no. ______
   Problems, suggestions; ☒ Report attached See interview form

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

   Agency USEPA
   Contact Sandra Halstead (Name) — Federal Facilities RPM (Title) — ______ (Date) — (907) 271-1218 (Phone no.)
   Problems; suggestions; ☐ Report attached Not present

   Agency ADEM
   Contact Dennis Sheppard (Name) — ADEC RPM (Title) — ______ (Date) — ______ (Phone no.)
   Problems; suggestions; ☐ Report attached Not present

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-3 Sites

4. **Other interviews** (optional) ☒ Reports attached. (See interview forms)

Bob Hazlett, Environmental Scientist (USACE Alaska)

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ____________________

2. **Site-Specific Health and Safety Plan** ☒ Readily available ☒ Up to date ☐ N/A
☒ Contingency plan/emergency response plan ☒ Readily available ☒ Up to date ☐ N/A
Remarks: The Site-Specific Health and Safety Plan was drafted and implemented by the contractor, FES.

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: O&M and OSHA training records are maintained by contractors working on Fort Wainwright.

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits____________	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ____________________

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ____________________

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks : ____________________

7. **Groundwater Monitoring Records** ☒ Readily available ☒ Up to date ☐ N/A
Remarks: ____________________

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks ____________________

9. **Discharge Compliance Records**

☐ Air	☐ Readily available	☐ Up to date	☒ N/A
☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ____________________

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: Access and security are controlled at the installation access points.

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-3 Sites

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☒ Federal Facility in-house ☒ Contractor for Federal Facility
☐ Other:______________________________

2. **O&M Cost Records** (Not applicable)

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate: Not available ☐ Breakdown attached

Total annual cost by year for review period if available (not available)

From______ (Date)	To______ (Date)	______ (Total cost)	☐ Breakdown attached
From______ (Date)	To______ (Date)	______ (Total cost)	☐ Breakdown attached
From______ (Date)	To______ (Date)	______ (Total cost)	☐ Breakdown attached
From______ (Date)	To______ (Date)	______ (Total cost)	☐ Breakdown attached
From______ (Date)	To______ (Date)	______ (Total cost)	☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: Not applicable

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A

Remarks: Access is controlled by installation fencing (not site-specific). Damages to fencing adjacent to the Birch Hill Tank Farm identified in the last FYR were observed repaired.

B. Other Access Restrictions

1. **Signs and other security measures** ☒ Location shown on site map ☐ N/A

Remarks: Signage present at Birch Hill Tank Farm and along installation fencing.

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-3 Sites

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
   Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
   Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

   Type of monitoring (*e.g.*, self-reporting, drive by) Contractor-performed inspections & reporting
   Frequency At least annually
   Responsible party/agency Federal facility
   Contact Joseph Malen (Name) Restoration Program Manager (Title) 10-12 August 2015 (Date) (907) 361-4512 (Phone no.)

   Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
   Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

   Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
   Violations have been reported ☒ Yes ☐ No ☐ N/A
   Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
   Remarks Installation staff mentioned historical vandalism (spray painting of concrete jersey barriers, areas of fencing repaired after being cut). Damage to installation fencing was repaired, a second fence was installation, and no damage to the fence was observed at the time of the site inspection.

2. **Land use changes on site** ☒ N/A
   Remarks:

3. **Land use changes off site** ☐ N/A
   Remarks: Housing construction downgradient of OU-3 was mentioned in the last five-year review. Additional units were constructed as recently as 2010. A new gate was installed on Lazalle Road.

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
   Remarks:

B. Other Site Conditions

Remarks None

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-3 Sites

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A	
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A	
C. Treatment System ☐ Applicable ☒ N/A	
D. Monitoring Data ☒ Applicable ☐ N/A	
1.	Monitoring Data ☒ Is routinely submitted on time ☒ Is of acceptable quality
2.	Monitoring data suggests: ☒ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining
E. Monitored Natural Attenuation ☒ Applicable ☐ N/A	
1.	**Monitoring Wells** (natural attenuation remedy) ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☐ Good condition ☒ All required wells located ☒ Needs Maintenance ☐ N/A Remarks : Monitoring wells located at Remedial Areas 1B and 2 require maintenance due to frost heaving.
X. OTHER REMEDIES	
	If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction. Remarks : AS/SVE systems previously operated at the sites have been shut down.
XI. OVERALL OBSERVATIONS	
A.	**Implementation of the Remedy**
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). Remedies at each site were implemented to: 1) restore groundwater to drinking water quality within a reasonable timeframe, 2) reduce further migration of contaminated groundwater, 3) prevent use of groundwater with contaminants at levels above SDWA standards, and 4) prevent the migration of contaminants from soil to groundwater that would result in groundwater contamination and exceedance of SDWA standards. The remedies consisted of: 1) operating AS/SVE systems, 2) operating a dual-phase recovery system (Remedial Area 1B), 3) conducting an ISCO treatability study (Remedial Area 2), 4) injecting ORC into the groundwater (FEP Mileposts 2.7 and 3.0), 5) groundwater monitoring, and 6) implementing ICs. The remedies are functioning as intended by the ROD. At the Birch Hill Tank Farm, all COCs have attenuated to below the cleanup goals in the alluvial aquifer, in the alluvial and bedrock aquifers near the Truck Fill Stand, and in the alluvial and bedrock aquifers at the Thaw Channel Area. At the Valve Pits and ROLF, the remedies have been effective in removing COCs from the subsurface and substantially reducing groundwater contaminant source areas. Small areas of benzene contamination remain at Valve Pit A and at Former Building 1144. No recent COC exceedances have been identified at Valve Pit B, Valve Pit C, the Eight Car Header, and the Central Header. At FEP Mileposts 2.7 & 3.0 the concentrations of benzene remain high and exhibit increasing trends in several wells. Analysis shows that groundwater cleanup goals will not be achieved for these areas within a reasonable period of time. ICs are in place at each site to ensure that groundwater will not be used until cleanup goals are achieved.

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-3 Sites

B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. O&M consists of monitoring well inspections and maintenance (if necessary) at each site.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. The concentrations of benzene remain high and exhibit increasing trends in several wells at the FEP Milepost 2.7 and 3.0 sites. A data gap investigation for this area is currently under contract with the U.S. Army. The inhalation pathway should not have been eliminated during development of the cleanup goals for trimethylbenzenes (TMBs) in the 2002 Explanation of Significant Differences. The 1994 baseline risk assessment clearly considered residential inhalation of volatiles from tap water to be a complete exposure pathway. The cleanup goals for 1,2,4-TMB and 1,3,5-TMB should be re-evaluated and re-established.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. The well inventory at Birch Hill Tank Farm should be incorporated, where necessary, into the attenuation monitoring program for the bedrock aquifer. An optimized alluvium and bedrock well array should be selected to monitor the attenuation of recalcitrant COCs so a remedy completion strategy can be defined. Opportunities for optimization were not identified at the Valve Pits, ROLF, and FEP Milepost 2.7 and 3.0 sites. Five-year reviews should be discontinued at the Building 1168 Leach Well Site.

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-4 Landfill and Coal Storage Yard

I. SITE INFORMATION

Site name: OU-4 Landfill and Coal Storage Yard	**Date of inspection:** 11 August 2015
Location and Region: Fairbanks, Alaska/USEPA Region 10	**EPA ID:** AK6210022426
Agency, office, or company leading the five-year review: US Army Corps of Engineers, Buffalo District	**Weather/temperature:** Overcast/55-65ºC±

Remedy Includes: (Check all that apply)

☒ Landfill cover/containment
☒ Access controls
☐ Institutional controls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☒ Other An air sparging/soil vapor extraction system formerly operated at the coal storage yard. Treatment of groundwater is required if contaminant concentrations increase (not yet implemented).
☒ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls

Inspection team roster:

Mr. Brian Adams, Fort Wainwright Restoration Project Manager

Dr. Karen Keil, USACE Buffalo Risk Assessor

Ms. Holly Akers, PE, USACE Buffalo Project Engineer

Attachments: ☒ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Joseph Malen (Name) Restoration Program Manager (Title) 10 August 2015 (Date)
Interviewed ☒ at site ☒ at office ☐ by phone Phone no. (907) 361-4512
Problems, suggestions; ☒ Report attached See interview form

2. **O&M staff** Brian Adams (Name) Restoration Project Manager (Title) 10 August 2015 (Date)
Interviewed ☒ at site ☒ at office ☐ by phone Phone no. Not available
Problems, suggestions; ☒ Report attached See interview form

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency USEPA
Contact Sandra Halstead (Name) Federal Facilities RPM (Title) ________ (Date) (907) 271-1218 (Phone no.)
Problems; suggestions; ☐ Report attached Not present

Agency ADEC
Contact Dennis Sheppard (Name) ADEC RPM (Title) ________ (Date) ________ (Phone no.)
Problems; suggestions; ☐ Report attached Not present

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-4 Landfill and Coal Storage Yard

4. **Other interviews** (optional) ☒ Reports attached. (See interview forms)

Bob Hazlett, Environmental Scientist (USACE Alaska)

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______

2. **Site-Specific Health and Safety Plan** ☒ Readily available ☒ Up to date ☐ N/A
☒ Contingency plan/emergency response plan ☒ Readily available ☒ Up to date ☐ N/A
Remarks: The Site-Specific Health and Safety Plan was drafted and implemented by the contractor, FES.

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: O&M and OSHA training records are maintained by contractors working on Fort Wainwright.

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☒ Other permits ADEC Solid Waste	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☐ N/A
Remarks : Survey records were not found.

7. **Groundwater Monitoring Records** ☒ Readily available ☒ Up to date ☐ N/A
Remarks: ______

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks ______

9. **Discharge Compliance Records**

☐ Air	☐ Readily available	☐ Up to date	☒ N/A
☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: Access and security are controlled at the installation access points.

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-4 Landfill and Coal Storage Yard

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☒ Federal Facility in-house ☒ Contractor for Federal Facility
☐ Other: Contractors are used to perform routine O&M tasks while repair work (specifically the landfill cap and fencing) is completed by installation staff.

2. **O&M Cost Records (Not applicable)**

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate: Not available ☐ Breakdown attached

Total annual cost by year for review period if available (not available)

From (Date)	To (Date)	Total cost	
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: Not applicable

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A

Remarks: Access is controlled to all sites by installation fencing. The OU-4 Landfill is fenced independently and was observed in good condition with no damage.

B. Other Access Restrictions

1. **Signs and other security measures** ☒ Location shown on site map ☐ N/A

Remarks: Fencing present around the OU-4 Landfill and Coal Storage Yard.

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-4 Landfill and Coal Storage Yard

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Contractor-performed inspections & reporting
Frequency At least annually
Responsible party/agency Federal facility

Contact	Joseph Malen	Restoration Program Manager	10-12 August 2015	(907) 361-4512
	Name	Title	Date	Phone no.

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Violations have been reported ☒ Yes ☐ No ☐ N/A
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks Installation staff indicated that the Landfill fencing had been damaged in 2014 by vandals but has since been repaired and was observed in good condition at the time of the site inspection.

2. **Land use changes on site** ☒ N/A
Remarks:

3. **Land use changes off site** ☒ N/A
Remarks:

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks:

B. Other Site Conditions

Remarks

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-4 Landfill and Coal Storage Yard

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

A. Landfill Surface ☒ Applicable ☐ N/A

1. **Settlement** (Low spots) ☐ Location shown on site map ☒ Settlement not evident
Areal extent________ Depth ________
Remarks: ________

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident
Lengths________ Widths________ Depths________
Remarks: ________

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident
Areal extent________ Depth ________
Remarks : ________

4. **Holes** ☐ Location shown on site map ☒ Holes not evident
Areal extent________ Depth ________
Remarks : ________

5. **Vegetative Cover** ☒ Grass ☒ Cover properly established ☒ No signs of stress
☒ Trees/Shrubs (indicate size and locations on a diagram)
Remarks: See photo log and figures depicting photo locations.

6. **Alternative Cover (armored rock, concrete, etc.)** ☒ N/A
Remarks: ________

7. **Bulges** ☐ Location shown on site map ☒ Bulges not evident
Areal extent________ Height ________
Remarks: ________

8. **Wet Areas/Water Damage** ☒ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent ________
☐ Ponding ☐ Location shown on site map Areal extent ________
☐ Seeps ☐ Location shown on site map Areal extent ________
☐ Soft subgrade ☐ Location shown on site map Areal extent ________
Remarks: ________

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☒ No evidence of slope instability
Areal extent________
Remarks: ________

B. Benches ☐ Applicable ☒ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-4 Landfill and Coal Storage Yard

C. Letdown Channels ☐ Applicable ☒ N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

D. Cover Penetrations ☒ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☒ N/A
Remarks

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A
Remarks

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A
Remarks

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A
Remarks

5. **Settlement Monuments** ☒ Located ☐ Routinely surveyed ☐ N/A
Remarks Survey records not located.

E. Gas Collection and Treatment ☐ Applicable ☒N/A

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☒ N/A
Remarks

2. **Outlet Rock Inspected** ☐ Functioning ☒ N/A
Remarks

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

H. Retaining Walls ☐ Applicable ☒ N/A

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-4 Landfill and Coal Storage Yard

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

C. Treatment System ☐ Applicable ☒ N/A

D. Monitoring Data ☒ Applicable ☐ N/A

1. Monitoring Data
   ☒ Is routinely submitted on time ☒ Is of acceptable quality

2. Monitoring data suggests:
   ☒ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

E. Monitored Natural Attenuation ☒ Applicable ☐ N/A

1. **Monitoring Wells** (natural attenuation remedy)
   ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
   ☒ All required wells located ☐ Needs Maintenance ☐ N/A
   Remarks : ______________________________

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

Remarks : None

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

Remedies at each site were implemented to: 1) restore groundwater to its beneficial use of drinking water quality within a reasonable time frame, 2) reduce further migration of contaminated groundwater from the source area, 3) prevent use of groundwater containing contaminants at levels above federal MCLs and AWQS, and 4) use natural attenuation to attain AWQS. The landfill was capped, groundwater monitoring and ICs were implemented. Monitoring data indicates that remedy has reduced further migration of contaminated groundwater from the landfill site and prevented the use of groundwater containing contaminants above the site cleanup goals. Reductive dechlorination is occurring is site groundwater. It is too early to determine whether the remedy will restore groundwater to its beneficial use of drinking water quality. An AS/SVE system was operated at the Coal Storage Yard from 1997 to 2000. Groundwater monitoring was performed until COCs were not detected. Monitoring was discontinued in 2003. All RAOs identified in the Rod have been attained.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

The scope and implementation of O&M procedures at the sites are adequate to assess current and long-term protectiveness of the remedies.

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-4 Landfill and Coal Storage Yard

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. None.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. The five-year review concurs with recommendations provided in the 2014 Annual Sampling Report (FES 2014h) for the landfill. No other opportunities for optimization were identified. Five-year reviews should be discontinued at the Coal Storage Yard site.

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-5 Sites

I. SITE INFORMATION	
Site name: OU-5 WQFS, EQFS, Area 1A (BHTF), and Open Burning/Open Detonation Area	**Date of inspection:** 11 August 2015
Location and Region: Fairbanks, Alaska	**EPA ID:** AK6210022426
Agency, office, or company leading the five-year review: US Army Corps of Engineers, Buffalo District	**Weather/temperature**: Overcast/55-65ºC±

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☒ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls
- ☒ Other WQFS had an air sparging/soil vapor extraction system with in situ soil heating option and downgradient AS curtain. A harbor boom is also deployed at this site as a component of the remedy.

Inspection team roster:

Mr. Brian Adams, Fort Wainwright Restoration Project Manager

Dr. Karen Keil, USACE Buffalo Risk Assessor

Ms. Holly Akers, PE, USACE Buffalo Project Engineer

Attachments: ☒ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Joseph Malen (Name) Restoration Program Manager (Title) 10-12 August 2015 (Date)
   Interviewed ☒ at site ☒ at office ☐ by phone Phone no. (907) 361-4512
   Problems, suggestions; ☒ Report attached See interview form

2. **O&M staff** Brian Adams (Name) Restoration Project Manager (Title) 10-12 August 2015 (Date)
   Interviewed ☒ at site ☒ at office ☐ by phone Phone no. ______
   Problems, suggestions; ☒ Report attached See interview form

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

   Agency USEPA
   Contact Sandra Halstead (Name) Federal Facilities RPM (Title) ______ (Date) (907) 271-1218 (Phone no.)
   Problems; suggestions; ☐ Report attached Not present

   Agency ADEM
   Contact Dennis Sheppard (Name) ADEC RPM (Title) ______ (Date) ______ (Phone no.)
   Problems; suggestions; ☐ Report attached Not present

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-5 Sites

4.	**Other interviews** (optional) ☒ Reports attached.			
Bob Hazlett, Environmental Scientist (USACE Alaska)				
III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	**O&M Documents**			
	☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
	☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
	☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A
	Remarks:			
2.	**Site-Specific Health and Safety Plan**	☒ Readily available	☒ Up to date	☐ N/A
	☒ Contingency plan/emergency response plan	☒ Readily available	☒ Up to date	☐ N/A
	Remarks: The Site-Specific Health and Safety Plan was drafted and implemented by the contractor, FES.			
3.	**O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: O&M and OSHA training records are maintained by contractors working on FWA.			
4.	**Permits and Service Agreements**			
	☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
	☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
	☒ Other permits RCRA permit (OB/OD)	☐ Readily available	☐ Up to date	☒ N/A
	Remarks:			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks:			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks :			
7.	**Groundwater Monitoring Records**	☒ Readily available	☒ Up to date	☐ N/A
	Remarks:			
8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	☒ N/A
	☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A
	Remarks:			
10.	**Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks:			

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-5 Sites

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☒ Federal Facility in-house ☒ Contractor for Federal Facility
☐ Other: Contractors are used to perform routine O&M tasks while repair work is completed by installation staff.

2. **O&M Cost Records** (Not applicable)

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate: ____________________ ☐ Breakdown attached

Total annual cost by year for review period if available (not available)

From__________To____________ ____________________ ☐ Breakdown attached
Date Date Total cost
From__________To____________ ____________ ☐ Breakdown attached
Date Date Total cost
From__________To____________ ____________ ☐ Breakdown attached
Date Date Total cost
From__________To____________ ____________ ☐ Breakdown attached
Date Date Total cost
From__________To____________ ____________ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: Not applicable.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☒ N/A

Remarks: ____

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks: Signs are present around select portions of the site (for example, signage is present around the Birch Hill Tank Farm ASTs). See the annual IC report for more detail.

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-5 Sites

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Contractor-performed inspections & reporting
Frequency At least annually
Responsible party/agency Federal facility

Contact	Joseph Malen	Restoration Program Manager	10-12 August 2015	(907) 361-4512
	Name	Title	Date	Phone no.

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Violations have been reported ☒ Yes ☐ No ☐ N/A
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks The 2014 IC report documented one trespassing event at the Open Burn/Open Detonation (OB/OD) site.

2. **Land use changes on site** ☒ N/A
Remarks:

3. **Land use changes off site** ☒ N/A
Remarks:

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☒ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks: OU-5 OB/OD road modified significantly in the last five years.

B. Other Site Conditions

Remarks

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-5 Sites

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

C. Treatment System ☐ Applicable ☒ N/A (Treatment systems not operational)

D. Monitoring Data ☒ Applicable ☐ N/A

1. Monitoring Data
☒ Is routinely submitted on time ☒ Is of acceptable quality

2. Monitoring data suggests:
☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

E. Monitored Natural Attenuation ☒ Applicable ☐ N/A

1. **Monitoring Wells** (natural attenuation remedy)
☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☒ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks : ______________________________

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

Remarks :A boom was deployed in the Chena River.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

Remedies were implemented at the WQFS and EQFS sites to: 1) restore groundwater to its beneficial use within a reasonable time frame, 2) reduce or prevent further migration of contaminated groundwater from source areas, 3) ensure that there is no risk to aquatic receptors through control of contaminant movement through groundwater to the Chena River, 4) remove LNAPL to the extent practicable to eliminate film or sheen from groundwater, 5) prevent use of groundwater containing contaminants above SDWA MCLs or AWQS, 6) prevent the migration of soil contaminants to groundwater at levels above SDWA, non-zero MCLGs, or AWQs, 7) reduce sources of contaminant releases to the Chena River, 8) Meet AWQS for the Chena River, 9) perform an aquatic assessment of the Chena River, 10) collect Chena River benthic macroinvertebrates for toxicological studies and bioassays, and 11) determine the reductions of contaminant load into the Chena River from the remedial actions and the associated changes to aquatic organisms. The remedies at these sites consisted of: 1) operating AS/SVE systems and an AS curtain (WQFS2), 2) seasonal deployment of a boom in the Chena River to collect sheen, 3) abandonment of fuel pipelines, 4) groundwater monitoring and natural attenuation, 5) implementing ICs.

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-5 Sites

	A remedy was implemented at the BHTF ASTs site to limit human health and terrestrial receptor exposure to lead contaminated soil. The remedy consisted of implementing ICs. In addition, excavation and disposal of lead contaminated soil will be performed after the ASTs are removed (milestone date is 2016). Groundwater contaminant levels at the WQFS remain above the cleanup goals and soil sampling data collected after active treatment indicates the presence of a smear zone that likely contributes to groundwater contamination. Groundwater monitoring in four areas known as Flowpaths A, B, C, and the Apple Street Hotspot has been discontinued because all groundwater cleanup goals have been attained. Groundwater at Flowpath D indicates that all COC concentrations have been attained, although a DRO exceedance was observed during the previous monitoring episode in 2010. An intermittent sheen continues to be observed on the Chena River. ICs are in place at all OU-5 sites and are functioning as intended. Treatment systems are not operated and monitoring is not performed at the OB/OD area.
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. O&M activities at the WQFS sites consist of monitoring well inspections and maintenance (if necessary), and deployment and maintenance of the Chena River boom. O&M activities at the EQFS sites consist of monitoring well inspections during the groundwater sampling events (every five years) and maintenance (if necessary). There are no O&M activities associated with the OU-5 BHTF ASTs.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. The Chena River boom was lifted off its supports in 2014 as a result of high water level. Measures should be implemented to prevent future displacement of the boom.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. Opportunities for optimization were not identified.

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-6

I. SITE INFORMATION	
Site name: Former Communications Site, OU-6	**Date of inspection:** 11 August 2015
Location and Region: Fairbanks, Alaska	**EPA ID:** AK6210022426
Agency, office, or company leading the five-year review: US Army Corps of Engineers, Buffalo District	**Weather/temperature:** Overcast/55-65ºC±

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other ______
- ☒ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Inspection team roster:

Mr. Brian Adams, Fort Wainwright Restoration Project Manager

Dr. Karen Keil, USACE Buffalo Risk Assessor

Ms. Holly Akers, PE, USACE Buffalo Project Engineer

Attachments: ☒ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Joseph Malen (Name) Restoration Program Manager (Title) 10-12 August 2015 (Date)
   Interviewed ☒ at site ☒ at office ☐ by phone Phone no. (907) 361-4512
   Problems, suggestions; ☒ Report attached See interview form

2. **O&M staff** Brian Adams (Name) Restoration Project Manager (Title) 10-12 August 2015 (Date)
   Interviewed ☒ at site ☒ at office ☐ by phone Phone no. ______
   Problems, suggestions; ☒ Report attached See interview form

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

   Agency USEPA
   Contact Sandra Halstead (Name) Federal Facilities RPM (Title) ______ (Date) (907) 271-1218 (Phone no.)
   Problems; suggestions; ☐ Report attached Not present

   Agency ADEM
   Contact Dennis Sheppard (Name) ADEC RPM (Title) ______ (Date) ______ (Phone no.)
   Problems; suggestions; ☐ Report attached Not present

4. **Other interviews** (optional) ☐ Reports attached.

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-6

Bob Hazlett, Environmental Scientist (USACE Alaska)

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
☐ O&M manual ☐ Readily available ☐ Up to date ☒ N/A
☐ As-built drawings ☐ Readily available ☐ Up to date ☒ N/A
☐ Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

2. **Site-Specific Health and Safety Plan** ☒ Readily available ☒ Up to date ☐ N/A
☒ Contingency plan/emergency response plan ☒ Readily available ☒ Up to date ☐ N/A
Remarks: The Site-Specific Health and Safety Plan was drafted and implemented by the contractor, FES.

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: O&M and OSHA training records are maintained by contractors working on FWA.

4. **Permits and Service Agreements**
☐ Air discharge permit ☐ Readily available ☐ Up to date ☒ N/A
☐ Effluent discharge ☐ Readily available ☐ Up to date ☒ N/A
☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☒ N/A
☐ Other permits______ ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks : ______

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☐ N/A
Remarks: No post-remedial groundwater monitoring has been performed. The remedy includes MNA and associated groundwater monitoring events are planned to start in FY16.

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks ______

9. **Discharge Compliance Records**
☐ Air ☐ Readily available ☐ Up to date ☒ N/A
☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: Access and security are controlled at the installation access points.

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-6

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☒ Federal Facility in-house ☒ Contractor for Federal Facility
☐ Other: Contractors are used to perform routine O&M tasks while repair work is completed by installation staff.

2. **O&M Cost Records** (Not Applicable)

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate: ____________________ ☐ Breakdown attached

Total annual cost by year for review period if available (not available)

From (Date)	To (Date)	Total cost	
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: Not applicable.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A

Remarks: Access is controlled to all sites by installation fencing.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☒ N/A

Remarks: ____________________

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-6

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	☐ Yes	☒ No	☐ N/A
Site conditions imply ICs not being fully enforced	☐ Yes	☒ No	☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Contractor-performed inspections & reporting
Frequency At least annually
Responsible party/agency Federal facility

Contact	Joseph Malen	Restoration Program Manager	10-12 August 2015	(907) 361-4512
	Name	Title	Date	Phone no.

Reporting is up-to-date	☒ Yes	☐ No	☐ N/A
Reports are verified by the lead agency	☒ Yes	☐ No	☐ N/A
Specific requirements in deed or decision documents have been met	☒ Yes	☐ No	☐ N/A
Violations have been reported	☐ Yes	☒ No	☐ N/A

Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks

2. **Land use changes on site** ☐ N/A
Remarks: Residential occupation began in July 2015.

3. **Land use changes off site** ☒ N/A
Remarks:

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☒ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks:

B. Other Site Conditions

Remarks

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-6

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

C. Treatment System ☐ Applicable ☒ N/A

D. Monitoring Data ☒ Applicable ☐ N/A

1. Monitoring Data (none submitted)
☐ Is routinely submitted on time ☐ Is of acceptable quality

2. Monitoring data suggests:
☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

E. Monitored Natural Attenuation ☒ Applicable ☐ N/A

1. **Monitoring Wells** (natural attenuation remedy)
☒ Properly secured/locked ☒ Functioning ☐ Routinely sampled ☒ Good condition
☒ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks : ____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

Remarks : ____

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy for OU-6 includes institutional controls to restrict excavation of soil and prohibit groundwater use and MNA. Groundwater monitoring will be used to assess the effectiveness of natural attenuation and the degradation processes and to track the extent of any contaminant migration; however, this component of the remedy has not yet been implemented. No intrusive activities were observed at OU-6 indicating that this portion of the remedy is effective and functioning as designed.

Five-Year Review Site Inspection Checklist
Fort Wainwright OU-6

B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. O&M procedures at OU-6 include sampling, monitoring and analysis of groundwater; IC inspections; routine maintenance; and, reporting. Groundwater monitoring work plans were recently approved by the USEPA and will be implemented in 2016. No groundwater monitoring was conducted from remedy selection in January 2014 to current (May 2016). Monitoring is an essential component of the remedy and should be conducted on a routine basis. Annual IC inspections and maintenance of the groundwater monitoring well network has been performed as required.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. No early indicators of potential remedy problems were identified.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. No opportunities for optimization were identified.

ATTACHMENT 5

Photographic Record

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Photograph and Orientation

OU1, 801 Drum Burial Site

US Army Corps of Engineers
Buffalo District

OU-1 801 Drum Burial Site

Document Name: 091215_FWA_A5_1.mxd
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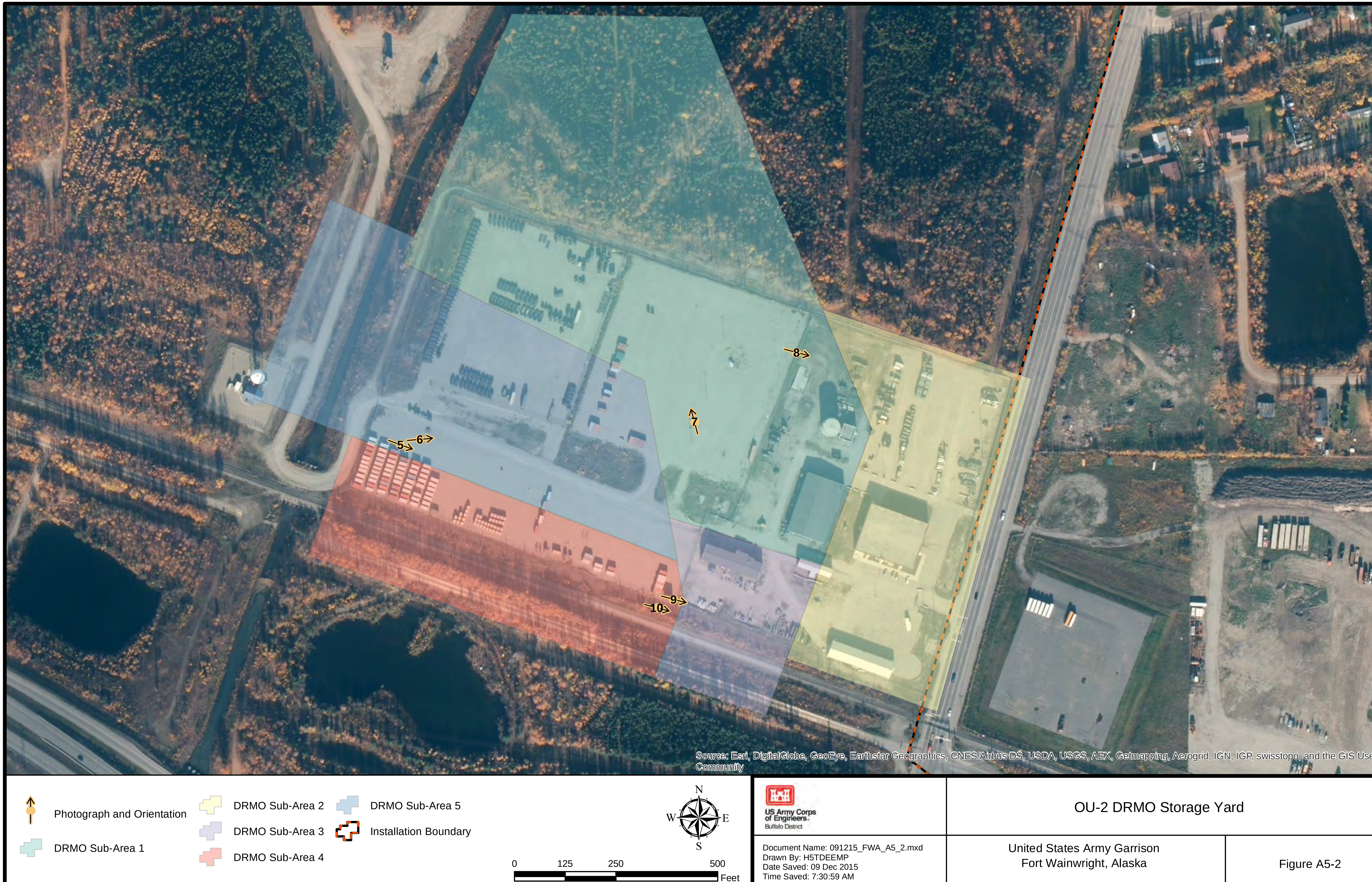
Time Saved: 7:22:40 AM

United States Army Garrison
Fort Wainwright, Alaska

Figure A5-1



US Army Corps of Engineers
Buffalo District

OU-2 DRMO Storage Yard

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Time Saved: 7:30:59 AM

United States Army Garrison
Fort Wainwright, Alaska

Figure A5-2

US Army Corps of Engineers
Buffalo District

OU-2 Building 1168

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Date Saved: 09 Dec 2015
Time Saved: 7:33:58 AM

United States Army Garrison
Fort Wainwright, Alaska

Figure A5-3

US Army Corps of Engineers
Buffalo District

OU-3 Remedial Area 2

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Drawn By: H5TDEEMP
Date Saved: 09 Dec 2015
Time Saved: 7:42:47 AM

United States Army Garrison
Fort Wainwright, Alaska

Figure A5 - 4

Photograph and Orientation

Milepost 3.0 POL Spill

Milepost 2.7 POL Spill

N W E S

0 250 500 1,000 Feet

US Army Corps of Engineers
Buffalo District

OU-3 Remedial Area 3

Document Name: 091215_FWA_A5_5.mxd
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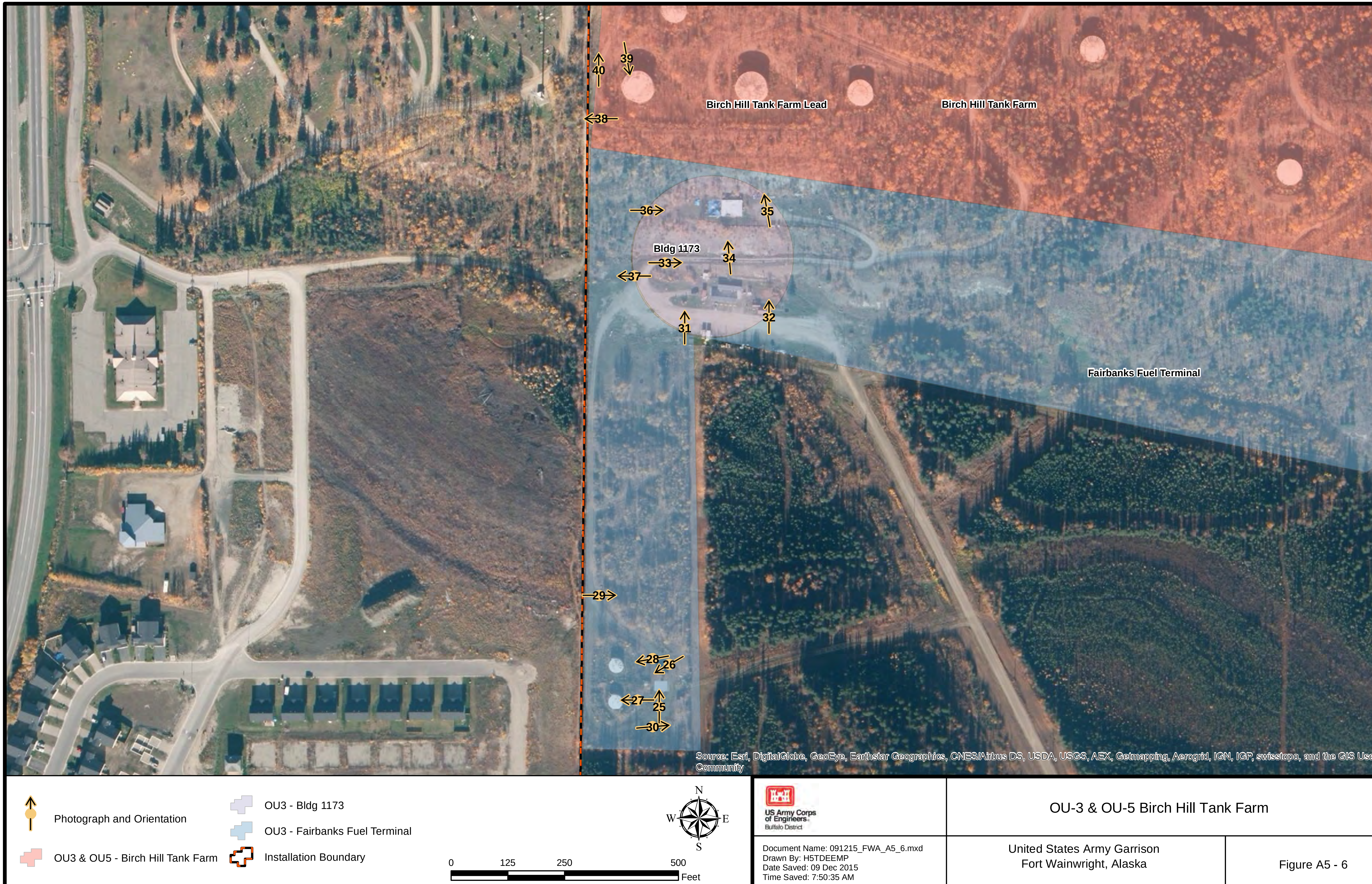
United States Army Garrison
Fort Wainwright, Alaska

Figure A5 - 5



US Army Corps of Engineers
Buffalo District

OU-3 & OU-5 Birch Hill Tank Farm

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Date Saved: 09 Dec 2015
Time Saved: 7:50:35 AM

United States Army Garrison
Fort Wainwright, Alaska

Figure A5 - 6

Photograph and Orientation

OU4 - Coal Storage Yard

0 250 500 1,000 Feet

N S W E

US Army Corps of Engineers
Buffalo District

OU-4 Coal Storage Yard

Document Name: 091215_FWA_A5_7.mxd
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Date Saved: 09 Dec 2015
Time Saved: 8:02:58 AM

United States Army Garrison
Fort Wainwright, Alaska

Figure A5 - 7

US Army Corps of Engineers
Buffalo District

OU - 4 Landfill

Document Name: 091215_FWA_A5_8.mxd
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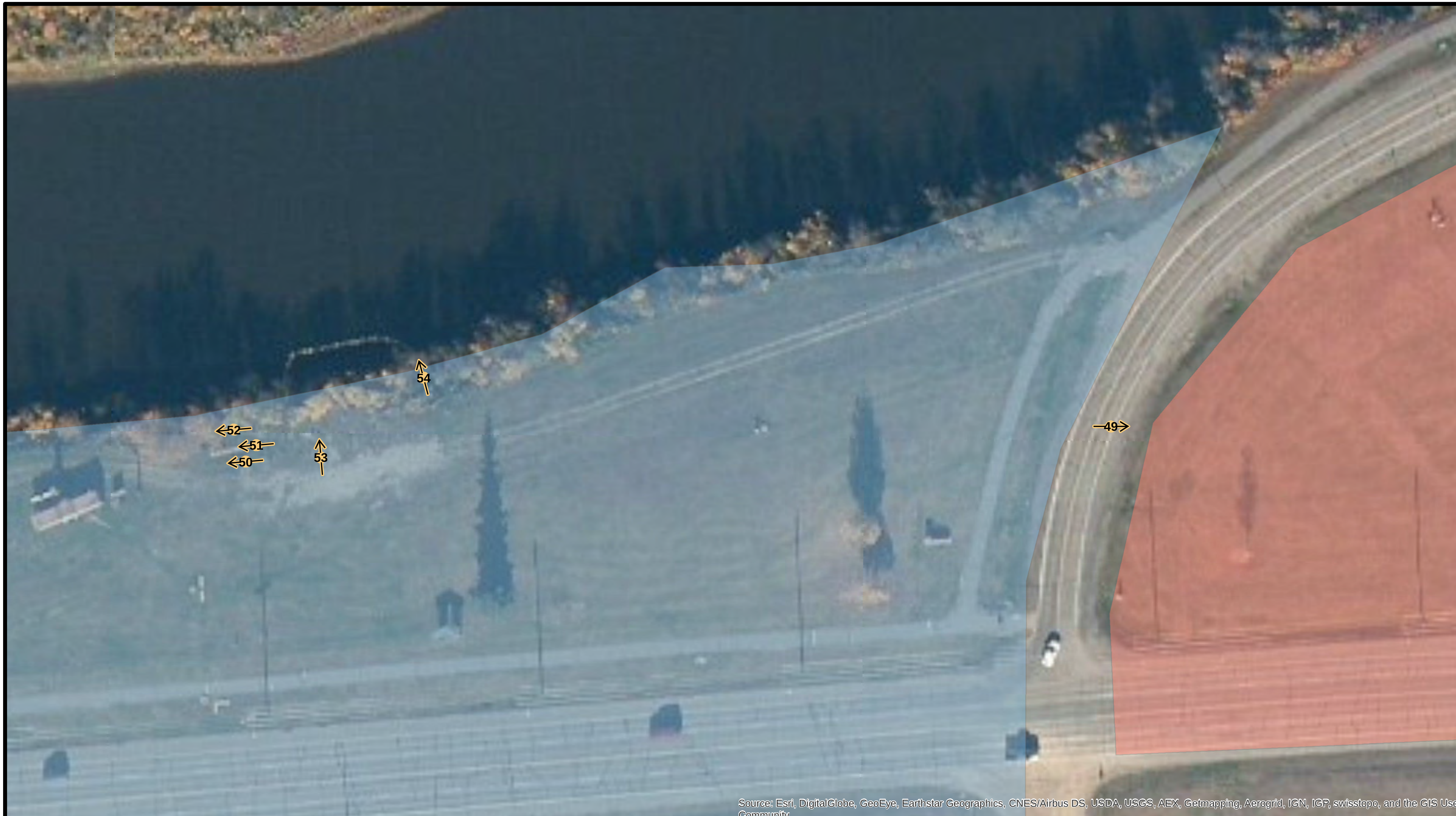
United States Army Garrison
Fort Wainwright, Alaska

Figure A5 - 8



Photograph and Orientation

OU5 - West Quartermaster's Fueling System

OU5 - East Quartermaster's Fueling System

N W E S

0 25 50 100 Feet

US Army Corps of Engineers
Buffalo District

OU-5 WQFS & EQFS

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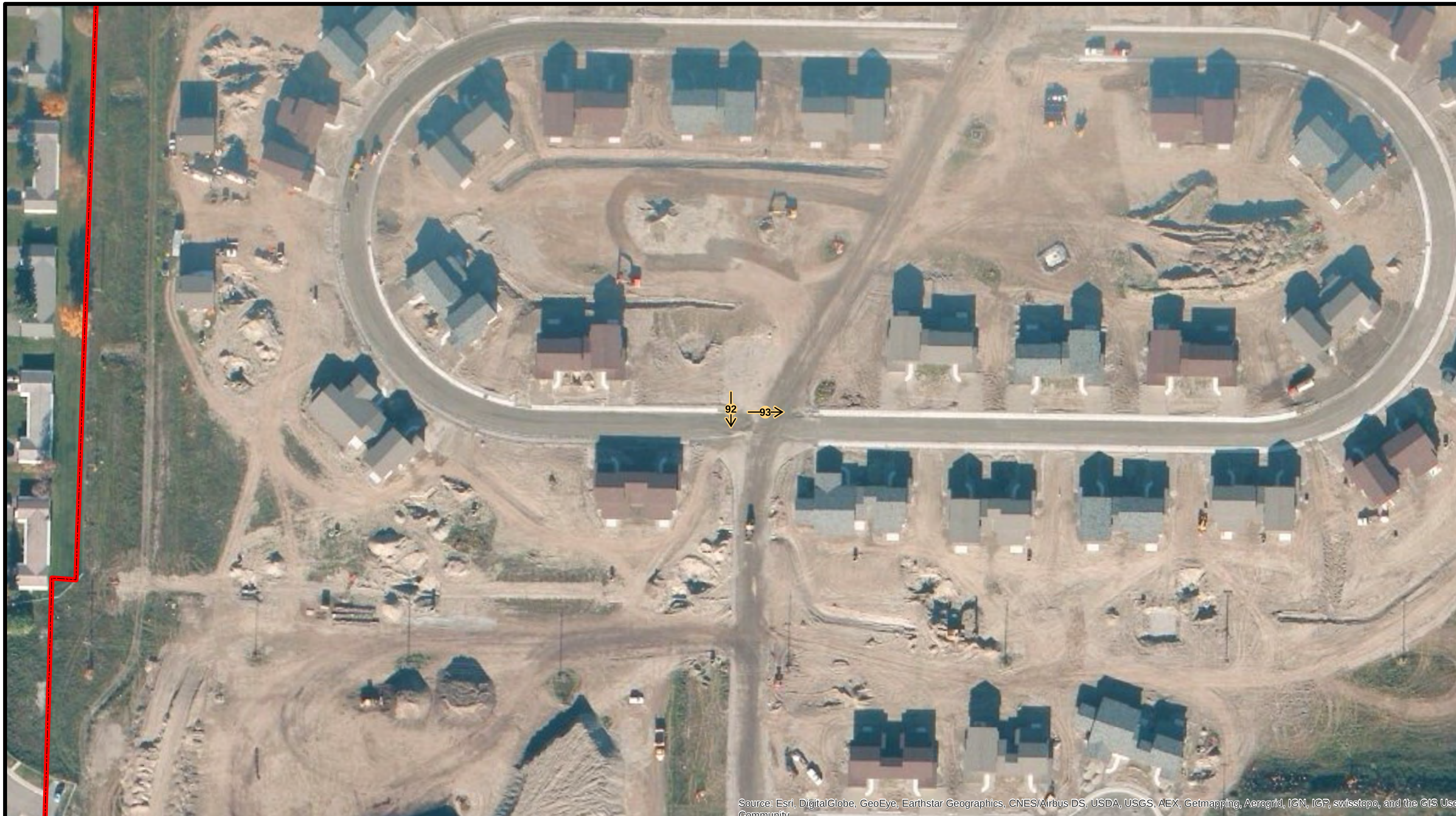
United States Army Garrison
Fort Wainwright, Alaska

Figure A5 - 9



Photograph and Orientation

OU-6 Boundary

N
W
E
S

0 50 100 200 Feet

US Army Corps of Engineers
Buffalo District

OU-6 Former Communications Site

Document Name: 091215_FWA_A5_10.mxd
Drawn By: H5TDEEMP
Date Saved: 16 May 2016
Time Saved: 4:36:00 PM

United States Army Garrison
Fort Wainwright, Alaska

Figure A5 - 10

PHOTOGRAPHIC RECORD Fort Wainwright	
OU-1	
Photo No. 1 (11-August-2015) Description: View looking east across the western portion of the 801 Drum Burial Site from River Road. Note monitoring well AP-6631.	
Photo No. 2 (11-August-2015) Description: View looking north across the western portion of the 801 Drum Burial Site and River Road.	

<table>
<tr><th colspan="2">PHOTOGRAPHIC RECORD
Fort Wainwright</th></tr>
<tr><td colspan="2">OU-1</td></tr>
<tr><td>Photo No. 3
(11-August-2015)

<u>Description</u>:

View looking south across the western portion of the 801 Drum Burial Site and River Road.</td><td></td></tr>
<tr><td>Photo No. 4
(11-August-2015)

<u>Description</u>:

View looking east at the Chena River from the northern portion of the 801 Drum Burial Site. Note monitoring well AP-6065 associated with OU-3 Valve Pit A.</td><td></td></tr>
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<tr><td colspan="2">PHOTOGRAPHIC RECORD
Fort Wainwright</td></tr>
<tr><td colspan="2">OU-2</td></tr>
<tr><td>Photo No. 5
(11-August-2015)

<u>Description</u>:

View looking east across DRMO Salvage Yards 4 and 5.</td><td></td></tr>
<tr><td>Photo No. 6
(11-August-2015)

<u>Description</u>:

Example of a “frost jacked” probe at DRMO 5 (Probe D, not included in the 2014 sampling event).</td><td></td></tr>
</table>

PHOTOGRAPHIC RECORD **Fort Wainwright**	
OU-2	
Photo No. 7 (11-August-2015) Description: View looking north across DRMO Salvage Yard 1.	
Photo No. 8 (11-August-2015) Description: View looking east across DRMO Salvage Yards 1 and 2.	

PHOTOGRAPHIC RECORD Fort Wainwright	
OU-2	
Photo No. 9 (11-August-2015) Description: View looking east across DRMO Salvage Yard 3.	
Photo No. 10 (11-August-2015) Description: View of typical fencing and a sign at the OU-2 DRMO Salvage Yard.	

PHOTOGRAPHIC RECORD Fort Wainwright	
OU-2	
Photo No. 11 (11-August-2015) <u>Description</u>: View looking west at fencing at the Building 1168 site along Trainor Gate Road. Note monitoring well AP-6809.	
Photo No. 12 (11-August-2015) <u>Description</u>: View looking northeast across the Building 1168 site.	

PHOTOGRAPHIC RECORD **Fort Wainwright**	
OU-2	
Photo No. 13 (11-August-2015) Description: View of locked and labeled monitoring well AP-6809.	
Photo No. 14 (11-August-2015) Description: View of monitoring well AP-7143 with damaged bollard (not sampled in 2014).	

PHOTOGRAPHIC RECORD **Fort Wainwright**	
OU-3	
Photo No. 15 (11-August-2015) <u>Description</u>: View looking southeast at Valve Pit A. Note VPA-MP2 and VPA-MP5.	
Photo No. 16 (11-August-2015) <u>Description</u>: View looking north at Valve Pit B.	

PHOTOGRAPHIC RECORD
Fort Wainwright

OU-3

Photo No. 17 (11-August-2015) <u>Description</u>: View looking west at Valve Pit C. Note VPC-MP2.	
Photo No. 18 (11-August-2015) <u>Description</u>: View of underground fuel piping at the ROLF.	

PHOTOGRAPHIC RECORD
Fort Wainwright

OU-3

Photo No. 19 (11-August-2015) Description: View of a bird habitat under construction at the ROLF.	
Photo No. 20 (11-August-2015) Description: View of typical vegetation and concrete construction materials staged on ROLF.	

PHOTOGRAPHIC RECORD
Fort Wainwright

OU-3

Photo No. 21
(11-August-2015)

Description:

Typical view of vegetation at the ROLF.

Photo No. 22
(11-August-2015)

Description:

View of the ROLF informational sign.

PHOTOGRAPHIC RECORD
Fort Wainwright

OU-3

Photo No. 23 (11-August-2015) Description: View looking east across a training area just south of the Milepost 3.0 excavation. Note monitoring well AP-8711.	
Photo No. 24 (11-August-2015) Description: Example of a "frost jacked" monitoring well at Milepost 2.7.	

<table>
<tr><td colspan="2">PHOTOGRAPHIC RECORD
Fort Wainwright</td></tr>
<tr><td colspan="2">OU-3/OU-5 (Birch Hill Tank Farm)</td></tr>
<tr><td>Photo No. 25
(11-August-2015)

<u>Description</u>:

View looking north at a former truck fill stand on the southern portion of the Birch Hill Tank Farm.</td><td></td></tr>
<tr><td>Photo No. 26
(11-August-2015)

<u>Description</u>:

View of locked and labeled monitoring well AP-10229MW (GWP-121).</td><td></td></tr>
</table>

PHOTOGRAPHIC RECORD **Fort Wainwright**	
OU-3/OU-5 (Birch Hill Tank Farm)	
Photo No. 27 (11-August-2015) <u>Description</u>: View of a former AST location in the southern Birch Hill Tank Farm.	
Photo No. 28 (11-August-2015) <u>Description</u>: View of a concrete pad and underground fuel lines in the southern Birch Hill Tank Farm.	

PHOTOGRAPHIC RECORD
Fort Wainwright

OU-3/OU-5 (Birch Hill Tank Farm)

Photo No. 29
(11-August-2015)

Description:

Typical monitoring wells on the southern Birch Hill Tank Farm. Note monitoring wells AP-5782, AP-5783, and AP-7952.

Photo No. 30
(11-August-2015)

Description:

View of typical underground fuel piping located on the southern Birch Hill Tank Farm.

PHOTOGRAPHIC RECORD
Fort Wainwright

OU-3/OU-5 (Birch Hill Tank Farm)

Photo No. 31
(11-August-2015)

Description:

View of the Building 1173 staging area.

Photo No. 32
(11-August-2015)

Description:

View of 55-gallon drums stored within the Building 1173 staging area.

PHOTOGRAPHIC RECORD
Fort Wainwright

OU-3/OU-5 (Birch Hill Tank Farm)

Photo No. 33
(11-August-2015)

Description:

View looking east up the Birch Hill Tank Farm access road.

Photo No. 34
(11-August-2015)

Description:

View of underground fuel piping access along the access road to the Birch Hill Tank Farm.

PHOTOGRAPHIC RECORD
Fort Wainwright

OU-3/OU-5 (Birch Hill Tank Farm)

Photo No. 35
(11-August-2015)

Description:

View of former product recovery equipment.

Photo No. 36
(11-August-2015)

Description:

View looking east at the former product recovery building.

PHOTOGRAPHIC RECORD
Fort Wainwright

OU-3/OU-5 Birch Hill Tank Farm

Photo No. 37
(11-August-2015)

Description:

View of off-site residential units from Birch Hill.

Photo No. 38
(11-August-2015)

Description:

View of repaired fence at the Birch Hill Tank Farm.

PHOTOGRAPHIC RECORD **Fort Wainwright**	
OU-3/OU-5 Birch Hill Tank Farm	
Photo No. 39 (11-August-2015) Description: View of a former AST location at the Birch Hill Tank Farm.	
Photo No. 40 (11-August-2015) Description: View along the western fence line at the Birch Hill Tank Farm.	

PHOTOGRAPHIC RECORD
Fort Wainwright

OU-4

Photo No. 41 (11-August-2015) Description: View looking west across to the Coal Storage Yard.	
Photo No. 42 (11-August-2015) Description: View looking south at access fencing and signs at the Coal Storage Yard.	

PHOTOGRAPHIC RECORD
Fort Wainwright

OU-4

Photo No. 43
(11-August-2015)

Description:

View of the informational sign posted outside the Landfill.

Photo No. 44
(11-August-2015)

Description:

View of an access control sign outside the Landfill.

PHOTOGRAPHIC RECORD
Fort Wainwright

OU-4

Photo No. 45 (11-August-2015) Description: View looking northeast along the Landfill fencing.	
Photo No. 46 (11-August-2015) Description: View looking east across the Landfill cap.	

PHOTOGRAPHIC RECORD
Fort Wainwright

OU-4

Photo No. 47
(11-August-2015)

Description:

View of tree growth on the southeastern portion of the Landfill.

Photo No. 48
(11-August-2015)

Description:

View of tree growth on western portion of the Landfill cap.

PHOTOGRAPHIC RECORD **Fort Wainwright**	
OU-5	
Photo No. 49 (11-August-2015) Description: View looking east across the EQFS.	
Photo No. 50 (11-August-2015) Description: View looking west across the WQFS former remediation system.	

PHOTOGRAPHIC RECORD
Fort Wainwright

OU-5

Photo No. 51
(11-August-2015)

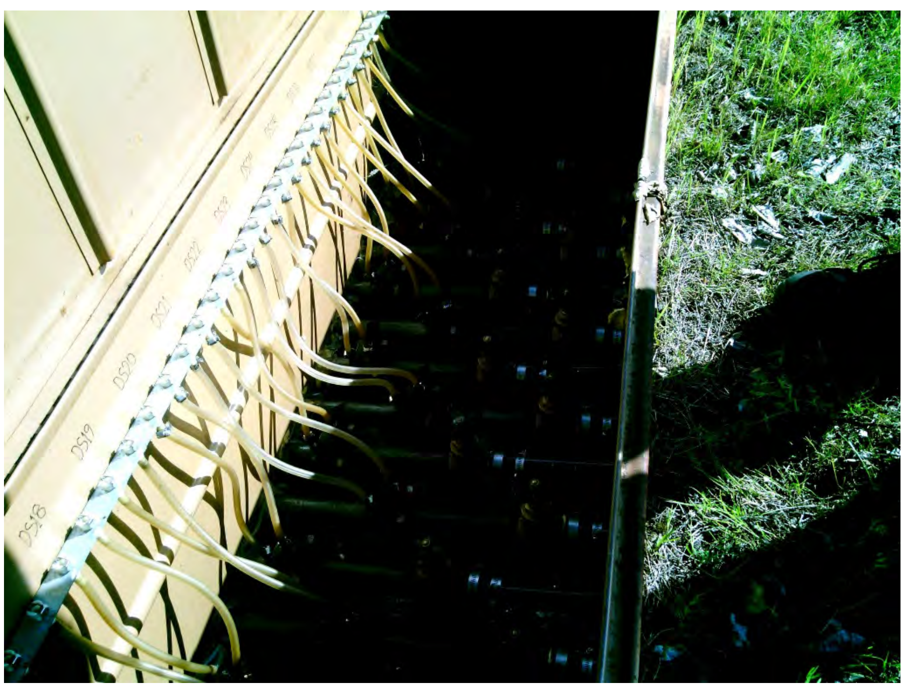
Description:

View looking west across the former injection banks on WQFS.

Photo No. 52
(11-August-2015)

Description:

View of the interior of an injection bank on WQFS.



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<tr><td colspan="2">PHOTOGRAPHIC RECORD
Fort Wainwright</td></tr>
<tr><td colspan="2">OU-5</td></tr>
<tr><td>Photo No. 53
(11-August-2015)

<u>Description</u>:

View of typical monitoring wells at WQFS.</td><td></td></tr>
<tr><td>Photo No. 54
(11-August-2015)

<u>Description</u>:

View of the boom in the Chena River at WQFS.</td><td></td></tr>
</table>

PHOTOGRAPHIC RECORD
Fort Wainwright

OU-6

Photo No. 55 (11-August-2015) Description: View looking south down Linden Avenue from Scapberry Loop.	
Photo No. 56 (11-August-2015) Description: Typical view of housing looking east down Scapberry Loop.	

Safety Clearance Survey to Support the Evaluation of the Proposed Staging Area for the Tanana River Burial Pit Removal Action
Project Photographs

1) Site photo prior to tree and brush removal showing soil material stockpile, looking south.

4) Site photo after tree and brush removal showing soil material stockpile and survey-grade GPS control point.

2) Site photo prior to tree and brush removal, looking north.

5) Site photo after tree and brush removal, looking east.

3) Site photo during clearing of trees and brush.

6) Site photo after tree and brush removal, looking north


7) SUXOS using Schonstedt to clear study area prior to work.


8) Surface metal debris located within study area.


9) Surface metal debris located within study area.


10) Surface/subsurface object identified as a target that yielded the highest response in the survey area.


11) Buried and exposed razor wire within study area.


12) Surveying surface metal debris using survey-grade GPS.

13) Survey base station set over control point on soil material stockpile shown in photograph 4.

14) EM61 instrument equipped with survey-grade GPS rover.

15) EM61 instrument equipped with survey-grade GPS rover collecting data along site access road.

16) EM61data collection.

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ATTACHMENT 6

Interview Records

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INTERVIEW DOCUMENTATION FORM

Fort Wainwright

The following is a list of individuals interviewed for this five-year review. See the attached contact record(s) for a detailed summary of the interviews.

Name	Title/Position	Organization	Date
Joseph Malen	*Restoration Program Manager*	*FWA*	*Aug 10-13, 2015*
Brian Adams	*Restoration Project Manager*	*FWA*	*Aug 10-13, 2015*
Sandra Halstead	*Federal Facilities RPM*	*USEPA*	*Jun 27, 2016*
Guy Warner	*ADEC RPM*	*ADEC*	*No response*
Craig Martin	*President*	*FES*	*No response*
Bob Hazlett	*Environmental Scientist*	*USACE, Alaska District*	*Feb 26, 2016*
Melvin Dennis Shepard	*Environmental Program Specialist*	*ADEC*	*Jun 7, 2016*

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FORT WAINWRIGHT FIVE-YEAR REVIEW INTERVIEW QUESTIONNAIRE

INTERVIEW RECORD	
Name: Joseph Malen	
Title: Chief, Environmental Restoration Branch	Organization: Directorate of Public Works, Environmental Div
Telephone No: 907-361-4512	E-Mail Address: joseph.s.malen.civ@mail.mil
Street Address:1046 Marks Street	City, State, Zip: Fort Wainwright, AK 99703
Interview Date: 29 February 2016	Site Name: **Fort Wainwright**
Interview Type: ☐ Telephone X Visit X Email X Questionnaire (by mail)	
Specific Site Involvement	
Operable Unit(s) Worked: X OU1 X OU2 X OU3 X OU4 X OU5 X OU6	
Date(s) of Involvement: 1993-1999, 2006 to Present Day	
Title / Position (with respect to sites): Lead Remedial Project Manager / Chief, Environmental Restoration Program	

The following general questions were adapted from the EPA's Comprehensive Five-Year Review Guidance. Please answer any questions that are applicable; if you need more space, you may attach a separate sheet.

INTERVIEW QUESTIONS

1. What is your overall impression of the work conducted at the site? *(general sentiment)*

The Army has been very proactive in maintaining Land Use Controls/Institutional Controls; conducting sampling and analyses at source areas as required by a Record of Decision (ROD); conducting investigations and remediation at newly discovered potential source areas; and not afraid of conducting Innovative Treatability Studies when appropriate and minimizing negative impacts to the environment when possible. The Army Environmental Command has provided additional assets to ensure the installation program remains viable and productive.

2. From your perspective, what effect have remedial operations at the site had on the surrounding community?

The Army has expended an incredible amount of time, effort, and resources to ensure areas of known contamination that have been noted in RODs are dealt with according to the appropriate laws/regulations. The most notable achievement has been the investigation and remediation of Operable Unit 6 (OU6) soils and ground water such that this housing area was approved for residential occupancy in the OU6 ROD. Occupants are required to attend briefings about the investigations and clean-up work that was accomplished from 2004-2013. The vast majority of the occupants are very pleased to hear of all the work and appreciate the Army's efforts on their behalf. Most people who come into the Environmental Division to ask questions are favorably impressed by all that has happened over the years.

3. Are you aware of any concerns from the local community regarding the site, operation, administration, implementation, or overall protectiveness of the remedies in the Record of Decision?

Most people who come into the Environmental Division to ask questions are favorably impressed by all that has happened over the years. I am only aware of one person who voiced his opinion that based on his personal experience, he would never trust Government sponsored work for anything.

4. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities?

For contaminated sites that have RODs in place, I am only aware of one location. Prior to the removal of the Above Ground Storage Tanks at the Fairbanks Terminal (part of OU5), people would cut the installation boundary fence to play on and around the tanks. Since the tanks were removed, there has been only one breach of the fence.

Otherwise, I am aware of one other trespass location. At the area now known as the Tanana River OB/OD site, a group of individuals had trespassed and set up an encampment along the Tanana River in an area that contained buried munitions in order to mine brass from the munitions. FWA security forces, BLM Special Investigators, and Environmental Division responded. The area is within the FWA Active Range Impact Area and Dud Impact Area; and since the time of the discovery of trespassers, FWA Range Control has increased patrols, added an additional gate to eliminate an access route, and inspected signs to ensure measures are in place to warn the public of the dangers associated with this active range area. The site is undergoing a Time Critical Removal Action to remove any immediate hazards/risks.

5. **Are you aware of any changes in land use, access, or other site conditions that have occurred since the last 5-Year Review (2011) that you feel may impact the protectiveness of the remedy(s)?**

There is no information at this time to indicate the protectiveness of the remedies has been impacted by activities at the site.

6. **Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years?**

FWA continues to repair and replace groundwater monitoring wells due to frost jacking caused by permafrost and extreme temperature variation; it is a fact of life in the Interior of Alaska that must be dealt with constantly.

7. **Are the remedies functioning as intended?**

The Army believes that remedies are functioning as intended. The Army has initiated data gap analyses to determine if anything else can be done at FTWW-055, FTWW-083, FTWW-084, and FTWW-096 to address Petroleum constituents in ground water.

8. **Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives used at the site at the time of the remedy still valid?**

The exposure assumptions, toxicity data, cleanup levels and remedial action objectives used at the site at the time of the remedy are still valid.

9. **Have there been opportunities to optimize the operation, maintenance, or sampling efforts? Please describe changes, cost savings, and/or improved efficiency.**

The Army continues to run MAROS and present results to the RPMs with recommendations on which Monitoring Wells to remove from the program. CoCs and frequency of sampling events are also evaluated by the RPMs.

10. **Do you have any comments, suggestions, or recommendations regarding the site's management or operation?**

Site management would be greatly enhanced if additional permanent personnel could be hired for the program. Despite the reduced number of CERCLA sites being evaluated, the list of Two-Party sites being addressed by the program has grown substantially. Contract document creation, review, and subsequent review of new data, increased number of meetings, and other staffing requirements continue to limit the effectiveness of the Army project managers especially when it comes to completing the Army's internal reporting requirements.

INTERVIEW RECORD

Site Name:	Fort Wainwright	**EPA ID No.:** AK210022426	
Subject:	Fourth Five-Year Review of Remedial Actions Conducted at Fort Wainwright (OU-1, OU-2, OU-3, OU-4, and OU-5)	**Time:**	**Date:** 10 August 2015
Type:	☐ Telephone ☒ Visit ☐ Other	☐ Incoming ☐ Outgoing	
Location of Visit:	Fort Wainwright Department of Public Works Offices		

Contact Made By:

Name: Holly Akers, PE	**Title:** Project Engineer	**Organization:** US Army Corps of Engineers, Buffalo District

Individual Contacted:

Name: Brian Adams	**Title:** Restoration Project Manager	**Organization:** Ft Wainwright

Telephone No: **Fax No:** (907) 361-9867 **E-Mail Address:** brian.m.adams.civ@mail.mil	**Street Address:** 1060 Gaffney Road, #4500 **City, State, Zip:** Ft Wainwright, AK 99703-4500

Summary Of Conversation

1. How long and in what capacity have you been involved with the restoration activities at Fort Wainwright?
   Employee of Fort Wainwright since 1995. Worked in Water and Solid Waste Program from 1995-2012 when I transitioned to current role as an RPM.
2. What is the current status of CERCLA (three party) restoration activities at Fort Wainwright?
   The restoration activities are going well. Recent activities include site maintenance due to vandalism of fencing at the Birch Hill Tank Farm and OU-4 Landfill, and contracted groundwater monitoring and IC inspections.
3. Have there been any complaints, violations, or other incidents related to the site included in this review?
   No, Fort Wainwright maintains a good relationship with regulators regarding OU-1 through OU-6.
4. Have there been any challenges with the sites?
   Trespassing and vandalism have been an issue for the Birch Hill Tank Farm and OU-4 Landfill. Fencing repairs are made as necessary. The off-site removal of trees (downgradient of the Birch Hill Tank Farm) is a concern due to the melting of permafrost and potential groundwater plume migration.
5. Are the remedies functioning as intended?
   Yes.
6. Has any other information come to light that could call into question the protectiveness of the remedy?
   No.
7. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?
   None.

FORT WAINWRIGHT FIVE-YEAR REVIEW INTERVIEW QUESTIONNAIRE

INTERVIEW RECORD	
Name: Sandra Halstead	
Title: Remedial Project Manager	Organization: USEPA
Telephone No: 907-271-1218	E-Mail Address: halstead.sandra@epa.gov
Street Address: 222 w. 7th Ave	City, State, Zip: Anchorage, AK, 99513
Interview Date: 6/27/2016	Site Name: **Fort Wainwright**
Interview Type: □ Telephone □ Visit x Email □ Questionnaire (by mail)	
Specific Site Involvement	
Operable Unit(s) Worked: x OU1 x OU2 x OU3 x OU4 x OU5 x OU6	
Date(s) of Involvement: June 2013 to present	
Title / Position (with respect to sites): USEPA CERCLA Project Manager	

The following general questions were adapted from the EPA's Comprehensive Five-Year Review Guidance. Please answer any questions that are applicable; if you need more space, you may attach a separate sheet.

INTERVIEW QUESTIONS

1. **What is your overall impression of the work conducted at the site? *(general sentiment)***

Overall the long term groundwater monitoring program at Fort Wainwright is robust and credible to assess if the groundwater remedies implemented at the site are effective in meeting cleanup goals. The institutional control portion of the remedies have improved with increased attention to the dig permit process and annual site inspection reports.

2. **From your perspective, what effect have remedial operations at the site had on the surrounding community?**

I have not had a chance to interact with any of the community in regard to the environmental restoration program as the Restoration Advisory Board was disbanded prior to my involvement at Fort Wainwright.

3. **Are you aware of any concerns from the local community regarding the site, operation, administration, implementation, or overall protectiveness of the remedies in the Record of Decision?**

No, there have not been any public meetings for Fort Wainwright Environmental Restoration Program since I joined the site team in June 2013.

4. **Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities?**

Yes, vandalism and minor trespass are documented in the annual inspection reports. The major trespass event at the Tanana River OBOD site, near the OU5 OB/OD site, was first reported to EPA in a written technical memorandum 16 months after the notification time period for discovery of a new site.

5. Are you aware of any changes in land use, access, or other site conditions that have occurred since the last 5-Year Review (2011) that you feel may impact the protectiveness of the site?

For OU5, the removal of the above-ground storage tanks may impact the protectiveness in allowing for additional characterization of the soil sources and possible re-evaluation of the soil and OU3 groundwater remedies. For OU5 OBOD, the discovery of the nearby Tanana River OB/OD River site (CC-FTWW-068) in June 2013 and the subsequent creation of an access road to the site provides potential access to the OU5 OBOD area from the river.

6. Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years?

Yes, there have been some missed Long Term groundwater monitoring events due to contracting issues. Additionally, there have been costs associated with treatability studies at OU2, OU5 that have not been well documented.

7. Are the remedies functioning as intended?

For many of the OUs, physical source removal and/or the selected remedies of Air Sparge/Soil Vapor Extraction to reduce source area concentrations have worked well but have reached a point where the energy to operate the system outweighs extraction of any remaining residual soil contamination. The Army implemented post-ROD treatability studies at OU2 and OU5 which seem to have been effective in dropping concentrations near remedial goals. The groundwater remedies which include Monitored Natural Attenuation are well documented through groundwater geochemistry in addition to contaminant concentrations.

For most sites which had both active treatment and MNA as groundwater remedies, contaminant concentrations have declined but have not met cleanup goals in the 'reasonable timeframe', which were not specified in most RODs but are approaching 20 years post ROD for most OUs.

8. Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives used at the site at the time of the remedy still valid?

Vapor intrusion from volatile organic contaminants in soils and groundwater is an exposure pathway that has not been assessed for OU1-5 sites.

USEPA drinking water program published a health advisory level for the emerging contaminant of the poly- and per- fluorinated compounds in June 2016, and the Army released a directive to identify any potential human exposures to the PFAS compounds in drinking water on June 10, 2016. OU4 Fire Training Area is the site most obviously impacted by this directive, but there may be additional areas where the Aqueous Fire Fighting Foams were used at Fort Wainwright that should be investigated.

The exposure assumptions that OU5 OBOD was restricted access due to its location on the edge of an operational range was called into question with the trespass event at the nearby Tanana River OBOD site, also within the restricted access operational range.

9. Have there been opportunities to optimize the operation, maintenance, or sampling efforts? Please describe changes, cost savings, and/or improved efficiency.

Fort Wainwright has been very pro-active in assessing groundwater monitoring networks using MAROS and reducing monitoring wells or events if the analysis suggests redundancy.

The discovery of the previously unknown Tanana River OBOD site, within 1000 ft of the known OU5 OBOD site, casts uncertainty on the characterization and extent of the OU5 OBOD site during the sampling effort conducted under the RI in the mid-1990s.

10. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

The institutional control program at Fort Wainwright should be re-evaluated in light of the failure to detect the major trespass event at the Tanana River Site, near OU5 OBOD, in 2013. Annual IC inspections reports since 2012 are a positive step towards improving IC enforcement at the installation, however in 2012, an on-site inspection of OU5 OBOD was not performed which may have revealed trespass activity at the nearby Tanana River site.

At OU2 and OU5, the post-ROD treatability studies should be documented with summary reports.

Interim Remedial Action Completion Reports could be developed for individual sites within OUs that have achieved RAOs and will no longer be actively monitoring groundwater, however ICs remain a component of the remedies at these sites.

More frequent communication between Fort Wainwright and the regulators would allow for more flexible decisions. The revival of at least quarterly RPM meetings (starting Jan 2016) and the quarterly report as required by the FFA has helped to increase communication and discussion of issues early.

FORT WAINWRIGHT FIVE-YEAR REVIEW INTERVIEW QUESTIONNAIRE

INTERVIEW RECORD	
Name: Bob Hazlett	
Title: Environmental Scientist	Organization: U.S. Army Corps of Engineers
Telephone No: 907-753-2623	E-Mail Address: bob.c.hazlett@usace.army.mil
Street Address: 2204 3rd St	City, State, Zip: JBER, AK 99518
Interview Date: 26 February 2016	Site Name: **Fort Wainwright**
Interview Type: ☐ Telephone ☐ Visit ☐ Email X Questionnaire (by mail)	
Specific Site Involvement	
Operable Unit(s) Worked: X OU1 X OU2 X OU3 X OU4 X OU5 X OU6	
Date(s) of Involvement: 2002 through present	
Title / Position (with respect to sites): Technical Lead	

The following general questions were adapted from the EPA's Comprehensive Five-Year Review Guidance. Please answer any questions that are applicable; if you need more space, you may attach a separate sheet.

INTERVIEW QUESTIONS

1. What is your overall impression of the work conducted at the site? *(general sentiment)*

   The Army has been very proactive regarding investigation and remediation of contaminated sites. Because of the challenging conditions, the Army has tried many innovative technologies, and numerous sites have been effectively remediated. Most notably, sites in OU3 and OU5 with extensive contaminant plumes have been successfully cleaned up. Although there are still many contaminated sites remaining on Ft Wainwright and a lot of work still to do, my impression is that the Ft Wainwright environmental program is doing its best to minimize any threat to the people living and working on the Base, as well as the surrounding community.

2. From your perspective, what effect have remedial operations at the site had on the surrounding community?

   The Army's biggest concern is to ensure contamination is not migrating off-site that could affect the general public. To the best of my knowledge, this has only happened a few times and the Army has been successful in fixing the problem. I am not aware of any lasting adverse effects on the surrounding community.

3. Are you aware of any concerns from the local community regarding the site, operation, administration, implementation, or overall protectiveness of the remedies in the Record of Decision?

   The Army has reached out to the community in the form of Public Meetings and formation of a Restoration Advisory Board (which was disbanded due to lack of interest). I am not aware of any community concerns regarding environmental issues at Ft Wainwright.

4. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities?

   There was a problem with vandalism at the Birch Hill Tank Farm (kids breaking through the fence and writing graffiti on the tanks), but since the tanks have been removed, this has stopped. I'm not aware of any response being taken by local authorities, or of any other issues at existing operable unit sites.

5. Are you aware of any changes in land use, access, or other site conditions that have occurred since the last 5-Year Review (2011) that you feel may impact the protectiveness of the site?

   I'm not aware of any such changes that would impact the protectiveness of the remedies implemented at any of the existing operable units.

6. Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years?

   There have been some unexpected minor costs (wells needing to be replaced, etc), but to the best of my recollection there have not been any significant unexpected costs related to the established operable units in the last five years.

7. Are the remedies functioning as intended?

   The remedies appear to be functioning as intended, however site conditions at the OU3 Birch Hill Tank Farm and the OU3 FEP Milepost sites have made remedial efforts challenging. The Army is currently conducting studies to determine what can be done at each of these sites to ensure continued protectiveness.

8. Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives used at the site at the time of the remedy still valid?

   Yes, I believe that the remedial objectives for the existing operable units are still valid.

9. Have there been opportunities to optimize the operation, maintenance, or sampling efforts? Please describe changes, cost savings, and/or improved efficiency.

   Yes, remedial efforts at each of the operable units have been consistently optimized to provide improvements and cost savings to the Army. Treatment systems have been shut down and decommissioned when appropriate. The monitoring program at each site is evaluated annually, and has been continually revised to ensure only appropriate wells and analytical parameters are being sampled.

10. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

    The FTW environmental program has been understaffed for many years, which is the root cause of most of the problems now facing the program (regulatory issues, etc). Given the existing workload, the most significant thing that could be done to improve site management and operations would be to hire more people.

FORT WAINWRIGHT FIVE-YEAR REVIEW INTERVIEW QUESTIONNAIRE

INTERVIEW RECORD						
Name: Melvin Dennis Shepard						
Title: Environmental Program Specialist			Organization: Alaska Dept. of Environmental Conservation			
Telephone No: 907-451-2180			E-Mail Address: dennis.shepard@alaska.gov			
Street Address: 610 University Avenue,			City, State, Zip: Fairbanks, AK 99709			
Interview Date: 7-21-2016			Site Name: **Fort Wainwright**			
Interview Type:	☐ Telephone	☐ Visit	X Email	Questionnaire (by mail)		
Specific Site Involvement						
Operable Unit(s) Worked:	X OU1	X OU2	X OU3	X OU4	X OU5	X OU6
Date(s) of Involvement: November 25, 2015 – present. ADEC RPM.						
Title / Position (with respect to sites): ADEC Restoration Project Manager / State regulatory oversite						

The following general questions were adapted from the EPA's Comprehensive Five-Year Review Guidance. Please answer any questions that are applicable; if you need more space, you may attach a separate sheet.

INTERVIEW QUESTIONS

1. What is your overall impression of the work conducted at the site? *(general sentiment)*

In general, the Army has made a major effort to investigate and cleanup environmental contamination in compliance with State and Federal Environmental cleanup standards and regulations at the Fort Wainwright NPL site. The environmental program is mature and remedial actions are nearing completion for the majority of sites though long-term monitoring of groundwater contaminant plumes is ongoing.

Although the bulk of the remedial actions are complete, there is a need for increased attention to operations and maintenance, institutional controls and oversight of new releases and newly discovered historic contamination. Recent enforcement actions and regulatory fines are indicative of the fact that these activities require greater attention by Garrison environmental personnel.

2. From your perspective, what effect have remedial operations at the site had on the surrounding community?

Fort Wainwright remedial operations have a positive effect on human health and the environment as well as the local economy.

3. Are you aware of any concerns from the local community regarding the site, operation, administration, implementation, or overall protectiveness of the remedies in the Record of Decision?

The Chena River boom area at OU-5 is a visual feature that indicates to the community that contaminates may be entering the surface water of the Chena River. The Department of Environmental Conservation (DEC) has expressed some concerns for the site and potential for contaminant migration from the OU-5 source areas. Site monitoring has documented a number of exceedances of the Alaska Water Quality Standards.

4. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities?

A trespass violation at the OU-5 OB/OD – River site required the Army to undertake a Time Critical Removal Action to address potential military munitions and related constituents. Also, there have been instances of trespass at the Birch Hill Tank Farm (OU-3 & OU-5) documented in recent Institutional Control Inspection reports.

5. Are you aware of any changes in land use, access, or other site conditions that have occurred since the last 5-Year Review (2011) that you feel may impact the protectiveness of the site?

Removal of vegetation during the Time Critical Removal Action conducted in response to the trespass violation at the OU-5 OB/OD – River site created easy access to the OU-5 OB/OD area and the active range fans from the Tanana River. Strengthening the institutional controls and addition of engineering controls may be necessary to stop further incidence of trespass to the area due to the change in site conditions.

6. Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years?

Yes several compliance failures resulted in unanticipated fines from the regulatory agencies. The trespass violation at the OU-5 OB/OD – River site has resulted in unforeseen costs to the Army and has resulted in a RCRA violation and EPA RCRA concerns. Costs for this removal effort are ongoing and additional site inspections may be required.

Several RCRA violations were discovered in 2014 for UST protections including failure to provide release detection for tanks and piping; failure to operate and maintain cathodic protection; failure to report a suspected release; failure to investigate and confirm a release; and failure to comply with temporary closure requirements. These violations resulted in RCRA fines.

In 2015, DEC issued a Notice of Intent to issue a Mandatory Compliance Order concerning corrective actions at the Former AFFES PX Gas Station (Building 3562 – UST numbers 177, 179 and 180). DEC and the Army settled the matter in January 2016 with a Compliance Order by Consent and Agreement Settling Liability. DEC issued a fine for these violations and required removal of the USTs and cleanup of soil contamination which resulted in significant cost to the Army.

Army oversight of transport, storage and disposal of regulated soil is a concern. The most notable lapse of oversight was an incidence of unauthorized soil disposal to an off Garrison residence. Army oversight and coordination with contractors is an O&M area where improvements can be made.

7. Are the remedies functioning as intended?

For many of the Operable Units (OUs) there is concern for the timelines of the remedies. At OU-3 and OU-5 many sites are projected to have increased timelines to achieve the remedial action goals and remedial action objectives that were identified in the Records of Decision.

8. Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives used at the site at the time of the remedy still valid?

EPA health advisories have been issued for emerging contaminants (Perfluorinated compounds – PFOS & PFOA) and the Army provided a memorandum/policy for Installation Management of PFCs on June 10, 2016. The policy requires the Army to sample drinking water systems and identify locations where PFOS and PFOA are known or suspected to have been released. Investigation of these contaminants may change protectiveness determinations for some OUs or necessitate the creation of new OUs.

Additional toxicity data have become available for many contaminants. In response DEC has proposed and is in the process of promulgating revised cleanup levels. Presuming the new cleanup levels are promulgated, protectiveness of the remedies will need to be re-evaluated during the 2021 Five Year Review.

9. Have there been opportunities to optimize the operation, maintenance, or sampling efforts? Please describe changes, cost savings, and/or improved efficiency.

   The Army has voluntarily contracted for site inspections and removal of obsolete tank and pipeline infrastructure within the Army Garrison. This proactive effort may prevent additional releases from residual petroleum in those structures and offset the need for further expenditures related to site releases of contaminants.

10. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

    The Army environmental program appears to be under staffed and struggling to meet regulatory requirements and manage its environmental contractors.

    DEC would like to see increased attention to documentation, communication and oversight of environmental activities, an accurate Site Management Plan and maintenance of enforceable schedules for primary documents and after action reports. The lack of timely communication and follow-through on newly discovered contamination and soil transport has resulted in regulatory agencies questioning of the Army Environmental Programs capacity to meet regulatory requirements.

    Army staff are working to improve communication with the regulators and have resumed monthly FFA meetings, however DEC has requested the Army contract an impartial third party facilitator to assist with coordination of meetings and tracking of action items, deadlines and document schedules.

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ATTACHMENT 7

ARAR Evaluation

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ARAR Evaluation

BACKGROUND

Section 121 (d)(2)(A) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) specifies that remedial actions must meet federal standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate requirements (ARARs). ARARs are those standards, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. To-Be-Considered criteria (TBCs) are non-promulgated advisories and guidance that are not legally binding, but should be considered in determining the necessary level of cleanup for protection of human health or the environment.

The final remedies selected for the site were designed to meet all chemical-specific, action-specific, and location-specific ARARs and consider all TBCs. Chemical-specific ARARs are health- or risk-based numerical values for individually listed contaminants in specific media. Action-specific ARARs are technology- or activity-based limitations or requirements that are selected to accomplish a remedy. Location-specific ARARs are restrictions placed on the concentration of chemicals or conduct of operations based on the location of a site.

OBJECTIVE

This evaluation is prepared to address Question B of the statement of service, "Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?"

This is the fourth Five-Year Review Report for Operable Units (OUs) 1, 2, 3, 4, and 5. The Record of Decision (ROD) for OU6 was signed in 2014, and therefore is included in this ARAR review.

EVALUATION

ARARs associated with remedial actions implemented at the following OUs at Fort Wainwright were evaluated to determine if cleanup levels and remedial action objectives (used at the time of the remedy selection) are still valid.

OU	Site Description	Media of Concern
1	801 Drum Burial Site	Soil and Groundwater
2	Defense Reutilization Maintenance Operation (DRMO) Yard	Groundwater
	Former Building 1168 Leach Well	Groundwater
3	Remedial Area 1b - Birch Hill Tank Farm	Groundwater
	Remedial Area 2 – Valve Pits and Railcar Off-Loading Facility	Groundwater

OU	Site Description	Media of Concern
	Remedial Area 3 - Fairbanks-Eielson Pipeline (FEP) Mileposts 2.7, 3.0, and 15.75	Groundwater
4	Landfill	Groundwater
	Coal Storage Yard (CSY)	Groundwater
5	West Quartermaster's Fueling System (WQFS)	Groundwater
	East Quartermaster's Fueling System (EQFS)	Groundwater
	Chena River	Surface Water
	Open Burn/Open Detonation (OB/OD) Area	Unexploded Ordnance
6	Former Communications Site (FCS)	Soil and Groundwater

As part of this fourth Five-Year Review, significant ARARs for each ROD were reviewed for changes or the promulgation of new laws since the ROD was signed that might be considered ARARs if the RODs were to be written today. New laws that might be considered ARARs today are applicable for Fort Wainwright only if they are essential to ensure protectiveness of the remedies.

OPERABLE UNIT 1 (OU-1)

OU-1 is comprised of one site: 801 Drum Burial Site.

801 Drum Burial Site (OU-1)

The Record of Decision for Operable Unit 1, Fort Wainwright, Fairbanks Alaska [United States Army (U.S. Army) 1997c] addressed potential risks to future hypothetical site users posed by soil and groundwater contamination.

Remedial Action Objectives (RAOs) for groundwater at the 801 Drum Burial Site, identified in Section 5.2.1.1 of the ROD for OU-1 [U.S. Army 1997c] were to:

- Ensure that groundwater use at the 801 Drum Burial Site meets federal and state standards.
- Minimize potential migration of contaminated groundwater to the Chena River and down gradient drinking water wells.
- Establish and maintain institutional controls (ICs) to ensure that the groundwater will not be used until federal and state MCLs are attained, except for activities undertaken to initiate the selected remedies.

RAOs for soil at the 801 Drum Burial Site, identified in Section 5.2.1.2 of the ROD for OU-1 [U.S. Army 1997c] were to:

- Prevent further leaching of contaminants from soil to groundwater.

- Reduce risks associated with exposure to contaminated soil and drums.
- Prevent migration of soil contaminants to groundwater, which could result in groundwater contamination and exceedances of state and federal MCLs and Alaska Water Quality Standards (AWQS; 18 Alaska Administrative Code [AAC] 70).

The selected remedy for the 801 Drum Burial Site in OU-1 at Fort Wainwright consisted of:

- Locating potential buried drums and, if found, removing and disposing of drums and contaminated soils, while restricting access to the source area during this work.
- Establishing and maintaining ICs to ensure that the groundwater will not be used until federal and state MCLs are attained, except for activities undertaken to initiate the selected remedies. ICs include restrictions governing site access, construction and well development or placement as long as hazardous substances remain on site that preclude unrestricted use.
- Natural attenuation of groundwater with long-term groundwater monitoring/evaluation.
- A groundwater contingent remedy which includes an air sparging/soil vapor extraction (AS/SVE) system to specifically treat VOCs. This remedy will be implemented if the plume shows an increasing trend over any three consecutive sampling events, or if designated monitoring points indicate the plume is migrating.

Section 5.4 of the ROD for OU-1 [U.S. Army 1997c] identified the most significant ARARs for the remedy selections for the 801 Drum Burial Site to be:

- Federal (40 Code of Federal Regulations [CFR] 141) and State of Alaska (18 Alaska Administrative Code [AAC] 80) Maximum Contaminant Levels (MCLs) – relevant and appropriate for groundwater and sets the active groundwater remediation goals. The Alaska Water Quality Standards (AWQS; 18 AAC 70) also apply.
- National Oil and Hazardous Substances Pollution Contingency Plan (NCP) off-site disposal rules – applicable for disposal of drums and contaminated soil.

Groundwater ARAR Evaluation

Five groundwater chemicals of concern (COCs) were identified in Table 7-1 of the Record of Decision (ROD) for OU-1 [U.S. Army 1997c]: aldrin, dieldrin, 1,1-dichloroethene (1,1-DCE) benzene, and vinyl chloride. A note to Table 7-1 of the OU-1 ROD stated that "Diesel-range organics will be cleaned up to levels consistent with proposed State of Alaska regulations (18 AAC 75)." Additionally, footnote "a" in the OU-1 ROD states, "Monitoring and sampling will follow EPA protocols and will not be limited to the specific contaminants of concern." The Draft 2015 Monitoring Report [FES 2016] indicates that "the EPA requested that cis-1,2-dichlorothene (cis-1,2-DCE) be added to the list of compounds tracked at the site." This is likely due to the fact that cis-1,2-DCE currently exceeds federal and State of Alaska MCLs. Therefore, both DRO and cis-1,2-DCE are listed as groundwater COCs for OU-1 in Table A.7-1 with ARAR-based cleanup goals to ensure the protectiveness of the groundwater remedy.

Risk-based concentrations (RBCs) equivalent to an excess lifetime cancer risks of $1x10^{-6}$ for residential exposure scenarios were adopted as groundwater cleanup goals for the pesticides aldrin and dieldrin since there were no Federal or State of Alaska MCLs for these contaminants at the time that the ROD for OU-1 was issued [U.S. Army 1997c]. Soil cleanup goals for the pesticides aldrin and dieldrin were RBCs equivalent to an excess lifetime cancer risks of $1x10^{-4}$ for residential exposure scenarios. A review of toxicity and risk assessment methodology changes to these risk-based groundwater cleanup goals is included in Attachment 8 of this Five-Year Review Report.

After the ROD for OU-1 was issued, the State of Alaska promulgated MCLs for the pesticides aldrin and dieldrin (18 AAC 75 Table C), as listed in Table A.7-1. However, these State of Alaska MCLs are an order of magnitude higher than the RBCs for groundwater that were adopted in the ROD for OU-1.

Federal and State of Alaska drinking water MCLs were adopted as groundwater cleanup goals for 1,1-DCE, benzene, and vinyl chloride at the 801 Drum Burial Site. Table 2-1 of the OU-1 Feasibility Study [U.S. Army 1997b] listed a groundwater cleanup goal of 15 µg/L for DRO, based upon the State of Alaska regulations (18 AAC 75) at that time. As summarized in Table A.7-1, the groundwater cleanup goal for DRO increased from 15 µg/L to 1500 µg/L. Since the cleanup goal increased, this change does no impact the protectiveness of the groundwater remedy. Since neither the Feasibility Study [U.S. Army 1997b], nor the ROD [U.S. Army 1997c] for OU-1 listed a groundwater cleanup goal for cis-1,2-DCE, a comparison to the current groundwater cleanup goals could not be made for this five-year review.

As summarized in Table A.7-1, there have been no changes to these MCL-based groundwater cleanup goals since the ROD for OU-1 [U.S. Army 1997c].

The AWQS can be found in 18 AAC 70 under (5) Petroleum Hydrocarbons, Oil and Grease, for Freshwater Uses. The cleanup level for groundwater that is hydraulically connected to surface water in total aromatic hydrocarbons (TAH) is 10 µg/L and total aqueous hydrocarbons (TAqH) is 15 µg/L. TAH is defined as the sum of benzene, toluene, ethylbenzene, and xylene (BTEX). Benzene was the only TAH identified as a COC for OU-1, with a cleanup criteria (MCL) of 5 µg/L. Therefore, the MCL for benzene is sufficiently protective to meet the AWQS.

Groundwater monitoring began after the ROD for OU-1 [U.S. Army 1997c] was signed. Currently, eight groundwater monitoring wells are included in the program, which have been sampled every five years since 2010. The 2010 Monitoring Report for the 801 Drum Burial Site [FES 2011] indicates that the five groundwater COCs listed in the ROD for OU-1, DRO, and cis-1,2-dichloroethene, which was added at the request of the United States Environmental Protection Agency (USEPA), are included in the groundwater monitoring program. Conclusions from the 2010 Monitoring Report for the 801 Drum Burial Site [FES 2011] include:

- Benzene has consistently exceeded the federal/state MCL of 5µg/L in monitoring well AP-6327 (located in the former source area) since 1997. Although a decreasing trend in benzene concentration is observed, the 2010 result is six times greater than the cleanup level.
- Dieldrin exceeded the risk-based cleanup goal (0.004 µg/L) established in the ROD for OU-1 [U.S. Army 1997c] in four wells (AP-6326, AP-10042MW [replacement well for AP-7163], AP-7282, and AP-6331).
- DRO exceeded the state MCL of 1500 µg/L in monitoring well AP-6327. The 2010 result was nearly two times greater than the cleanup level.

Cis-1,2-DCE has consistently exceeded the federal/state MCL of 70 µg/L in monitoring well AP-6326, however, this well was not sampled for volatile organic compounds in the 2010 sampling program. Since groundwater at the 801 Drum Burial Site has not attained the federal and state MCLs for 1,1-DCE, benzene, DRO, and vinyl chloride, and cis-1,2-DCE and risk-based cleanup goals for aldrin and dieldrin, ICs and continued groundwater monitoring are required to ensure the protectiveness of the groundwater remedy.

<u>*Soil ARAR Evaluation*</u>

Two soil COCs were identified in Table 7-1 of the ROD for OU-1 [U.S. Army 1997c]: aldrin and dieldrin. Additionally, a note to Table 7-1 of the OU-1 ROD stated that "Diesel-range organics will be cleaned up to levels consistent with proposed State of Alaska regulations (18 AAC 75)." As stated in Section 5.3 of the ROD for OU-1 [U.S. Army 1997c], these cleanup levels were protective of down gradient residential, commercial, and municipal utility system (MUS) well users.

Table 2-1 of the OU-1 Feasibility Study [U.S. Army 1997b] listed a subsurface soil cleanup goal of 200 mg/kg for DRO, based upon the State of Alaska regulations (18 AAC 75) at that time. As summarized in Table A.7-1, there have been changes to this state of Alaska ARAR-based soil cleanup goal since the ROD for OU-1 [U.S. Army 1997c]. The soil cleanup goal for DRO increased from 200 mg/kg to 250 mg/kg. Since the cleanup goal increased, this change does no impact the protectiveness of the soil remedy.

There are no newly promulgated or modified requirements of federal and state environmental laws that would change the protectiveness of the groundwater and soil remedies.

Since there were no cleanup goals for aldrin and dieldrin at the time of the ROD for OU-1, RBCs equivalent to an excess lifetime cancer risks of $1x10^{-4}$ for residential exposure scenarios were adopted as soil cleanup goals for the pesticides aldrin and dieldrin. After the ROD was issued, the State of Alaska promulgated soil cleanup levels for the pesticides aldrin and dieldrin that are protective of groundwater in the under 40 inch annual precipitation zone (18 AAC 75 Table B1), as listed in Table A.7-1. The new soil cleanup levels for aldrin and dieldrin are an order of magnitude lower than the RBCs for soil that were adopted in the ROD for OU-1. A review of toxicity and risk assessment methodology changes to the risk-based soil cleanup goals identified in the ROD for OU-1 is included in Attachment 8 of this Five-Year Review Report.

<u>OU-1 CONCLUSIONS</u>

There are no newly promulgated or modified requirements of federal and state environmental laws that would change the protectiveness of the groundwater and soil remedies implemented at the 801 Drum Burial Site at Fort Wainwright.

<u>OPERABLE UNIT 2 (OU-2)</u>

OU-2 is comprised of two sites: Defense Reutilization and Marketing Office (DRMO) Yard and Building 1168 Leach Well.

DRMO Yard (OU-2) and Building 1168 Leach Well (OU-2)

The Record of Decision for Operable Unit 2, Fort Wainwright, Fairbanks Alaska [U.S. Army 1997a] addressed potential risks to current and future hypothetical site users posed by groundwater contamination.

RAOs for groundwater and soil at the DRMO Yard and 1168 Leach Well, identified in Section 5.2 of the ROD for OU-2 [U.S. Army 1997a], were to:

Groundwater

- Restore groundwater to its beneficial use of drinking water quality within a reasonable time frame through source control.
- Reduce or prevent further migration of contaminated groundwater from the sources areas;
- Prevent use of groundwater containing contaminants at levels above Safe Drinking Water Act and State of Alaska Drinking Water Standard MCLs and Alaska Water Quality Standards.
- Use natural attenuation to attain Alaska Water Quality Standards (18 AAC 70) after reaching state and federal MCLs.

Soil

- Prevent migration of soil contaminants to groundwater, which could result in groundwater contamination and exceedances of state and federal MCLs and AWQS (18 AAC 70).

The selected remedy for the DRMO Yard in OU-2 at Fort Wainwright consisted of:

Soil Vapor Extraction and Air Sparging

- *In-situ* treatment of groundwater via AS to remove volatile organic compounds, thereby attaining RAOs.
- *In-situ* treatment of soil via SVE to prevent contaminated soil from acting as an ongoing source of contamination to groundwater.
- Treatment system evaluation and modification as necessary to optimize effectiveness.
- Periodic monitoring and evaluation of air emissions from the soil vapor AS/SVE treatment system to meet air emission requirements.
- Periodic groundwater monitoring and off-gas measurements to determine attainment of RAOs.

Natural Attenuation and Groundwater Monitoring

- Achieve AWQS through natural attenuation after active treatment attains state and federal maximum contaminant levels

Institutional Controls

Maintain ICs, including restricted access, well development restrictions and prohibition against refilling fire suppression water tank from the on-site well, as long as hazardous substances remain on site at levels that preclude unrestricted use.

The selected remedy for the Building 1168 Leach Well in OU-2 at Fort Wainwright consisted of:

Soil Vapor Extraction (SVE) and Air Sparging (AS)

- In situ treatment of groundwater via air sparging to attain state and federal drinking water standards.
- In situ treatment of soil via soil vapor extraction to prevent contaminated soil from acting as an ongoing source of contamination to groundwater.
- Treatment system evaluation and modification as necessary to optimize effectiveness.

- Periodic monitoring and evaluation of air emissions from the SVE/AS treatment system to meet air emission requirements.
- Periodic groundwater monitoring and off-gas measurements to determine attainment of RAOs.

Natural Attenuation and Groundwater Monitoring

- After active treatment achieves state and federal maximum contaminant levels, natural attenuation will be relied on to achieve Alaska Water Quality Standards.

Institutional Controls

- Maintaining ICs, including restricted access and well development restrictions, and as long as hazardous substances remain on site at levels that preclude unrestricted use.
- Additional ICs to prohibit refilling the DRMO Yard fire suppression water tank from the existing DRMO Yard potable water supply well until state and federal maximum contaminant levels are met (except in emergency situations).

Section 5.3 of the ROD for OU-2 [U.S. Army 1997a] identified the most significant ARARs for the remedy selections for the DRMO Yard and Building 1168 Leach Well to be:

- Federal (40 Code of Federal Regulations [CFR] 141) and State of Alaska (18 Alaska Administrative Code [AAC] 80) Maximum Contaminant Levels (MCLs) – relevant and appropriate for groundwater and sets the active groundwater remediation goals. The Alaska Water Quality Standards (AWQS; 18 AAC 70) also apply.
- Alaska oil pollution regulations (18 AAC 75) are applicable, and Alaska guidelines for non-UST petroleum-contaminated soil are to be considered. These guidelines require cleanup of petroleum-contaminated soils to protect groundwater quality.

Groundwater ARAR Evaluation

Six groundwater COCs were identified in Section 7.1.2.1 for the DRMO Yard and Section 7.2.3 for the Building 1168 Leach Well Site in the ROD for OU-2 [U.S. Army 1997a]: benzene, trichloroethene (TCE), tetrachloroethene (PCE), vinyl chloride (VC), 1,1-dichloroethene (1,1-DCE), and 1,2-dichloroethene (cis 1,2-DCE).

Federal and State of Alaska drinking water MCLs were adopted as groundwater cleanup goals for benzene, TCE, PCE, VC, 1,1-DCE, and cis 1,2-DCE at the DRMO Yard and Building 1168 Leach Well Sites. As summarized in Table A.7-2, there have been no changes to these MCL-based groundwater cleanup goals since the ROD for OU-2 [U.S. Army 1997a].

The AWQS can be found in 18 AAC 70 under (5) Petroleum Hydrocarbons, Oil and Grease, for Freshwater Uses. The cleanup level for groundwater that is hydraulically connected to surface water in total aromatic hydrocarbons (TAH) is 10 µg/L and total aqueous hydrocarbons (TAqH) is 15 µg/L. TAH is defined as the sum of benzene, ethylbenzene, toluene, and xylene (BETX). Benzene was the only TAH identified as a COC for OU-1, with a cleanup criteria (MCL) of 5 µg/L. Therefore, the MCL for benzene is sufficiently protective to meet the AWQS.

Since 2010 [FES 2015d], annual groundwater monitoring data for the Building 1168 Leach Well Site showed that benzene concentrations have been consistently below the MCL, therefore, further groundwater monitoring is not required to ensure the protectiveness of the groundwater remedy.

Annual groundwater sampling results since 2012 [FES 2015d] at the DRMO Yard indicate that biodegradation of PCE is occurring and PCE concentrations are stable or decreasing. However, since PCE concentrations continue to exceed MCLs, groundwater monitoring and ICs are required to ensure the protectiveness of the groundwater remedy.

Soil ARAR Evaluation

Three soil COCs were identified for the Buildings 1186 Leach Well Sites in Table 7-3 of the ROD for OU-2 [U.S. Army 1997a]: diesel range organics (DRO), gasoline range organics (GROs), and BTEX. Soil cleanup goals listed in Table 7-3 of the ROD for OU-2 (based upon 18 AAC 78) were considered guidance for the treatment of in situ soil.

One soil COC was identified for the DRMO Yard in Table 7-1 of the ROD for OU-2 [U.S. Army 1997a]: DRO. The soil cleanup goal listed in Table 7-2 of the ROD for OU-2 (based upon 18 AAC 78) was considered guidance for the treatment of in situ soil.

The soil remedy of in situ treatment via soil vapor extraction, to prevent contaminated soil from acting as an ongoing source of contamination, is in place. Therefore, these soil cleanup goals have been achieved and only the groundwater remedy continues.

OU-2 CONCLUSIONS

There are no newly promulgated or modified requirements of federal and state environmental laws that would change the protectiveness of the groundwater and soil remedies implemented at the DRMO Yard and Building 1168 Leach Well Sites at Fort Wainwright.

OPERABLE UNIT 3 (OU-3)

OU-3 is comprised of the following remedial areas (RAs): the Birch Hill Tank Farm (RA 1b), the Railroad Off-Loading Facility (RA 2), and Mileposts 2.7, 3.0, and 15.75 of the Fairbanks-Eielson Pipeline (RA 3).

The Record of Decision for Operable Unit 3, Fort Wainwright, Fairbanks Alaska [U.S. Army 1996b] addressed potential risks to current and future hypothetical site users posed by soil groundwater contamination.

RAOs for all source areas in OU-3 area, identified in Section 7.2 of the ROD for OU-3 [U.S. Army 1996b], were as follows:

Groundwater

- Restore groundwater to its beneficial use of drinking water quality within a reasonable time frame.
- Reduce or prevent further migration of contaminated groundwater.
- Prevent use of groundwater containing contaminants at levels above Safe Drinking Water Act levels.

Soil

- For petroleum-contaminated soil, prevent migration of contaminants from soil into groundwater that would result in groundwater contamination and exceedance of Safe Drinking Water Act standards.

The selected remedies for all source areas within OU-3 at Fort Wainwright, as listed in Section 10.0 of the ROD for OU-3 [U.S. Army 1996b] are described below.

Remedial Area 1b (Birch Hill Tank Farm)

- Soil vapor extraction of petroleum-contaminated soil and air sparging of petroleum-contaminated groundwater in permafrost-free areas to achieve Safe Drinking Water Act levels and natural attenuation to meet Alaska Water Quality Standards.

Remedial Area 2 (Railroad Off-Loading Facility)

- Soil vapor extraction of petroleum-contaminated soil and air sparging of petroleum-contaminated groundwater at known contaminant sources and at locations where MCLs are exceeded (i.e., “hot spots”) to achieve Safe Drinking Water Act levels and natural attenuation to meet Alaska Water Quality Standards.

Remedial Area 3 (Mileposts 2.7, 3.0, and 15.75)

- Soil vapor extraction of petroleum-contaminated soil and air sparging of petroleum-contaminated groundwater in permafrost-free areas at Milepost 2.7 and 3.0, and known source areas where MCLs were exceeded at Milepost 15.75, to achieve Safe Drinking Water Act levels and natural attenuation to meet Alaska Water Quality Standards.

Section 11.2.2 of the ROD for OU-3 [U.S. Army 1996b] identified the following chemical-specific ARARs for the remedy selections at RAs 1b, 2, and 3 in OU-3:

- Federal (40 Code of Federal Regulations [CFR] 141) and State of Alaska (18 Alaska Administrative Code [AAC] 80) Maximum Contaminant Levels (MCLs) – relevant and appropriate for cleanup of groundwater that may be used for a drinking water supply and sets the active groundwater remediation goals.
- Alaska Water Quality Standards (AWQS; 18 AAC 70) also apply for the protection of a Class 1(A) water supply for groundwater and must be met through natural attenuation after active remediation achieves MCLs.
- Alaska oil pollution regulations (18 AAC 75) are applicable, and Alaska guidelines for non-UST petroleum-contaminated soil are to be considered. These guidelines require cleanup of petroleum-contaminated soils to protect groundwater quality.
- Alaska Underground Storage Tank regulations (18 AAC 78) are relevant and appropriate to the active treatment of soil and groundwater until MCLs are achieved.

An explanation of significant differences (ESD) for OU-3 [U.S. Army 2002] was issued in 2002 to address more total volume and lateral extent of contamination in OU-3 than was previously documented in the ROD for OU-3 [U.S. Army 1996b]. The ESD concluded that significant changes to the scope of remedies selected in the ROD for OU-3 [U.S. Army 1996b] were required to fully achieve the RAOs. The ESD [U.S. Army 2002] did not change the RAOs and only provided clarification for ARARs in the ROD [U.S. Army 1996b].

Groundwater ARAR Evaluation

Seven groundwater COCs were identified for all source areas in OU-3 in Section 7.3.1 of the ROD for OU-3 [U.S. Army 1996b]: benzene, toluene, ethylbenzene, 1,2-dibromoethane, 1,2-dichloroethane, 1,2,3-trimethylbenzene, and 1,3,5-trimethylbenzene.

Federal and State of Alaska drinking water MCLs were adopted as groundwater cleanup goals for benzene, toluene, ethylbenzene, 1,2-dibromoethane, and 1,2-dichloroethane. Risk-based cleanup goals for 1,2,3-trimethylbenzene and 1,3,5-trimethylbenzene are further evaluated in Attachment 8 of this Five-Year Review Report.

As summarized in Table A.7-3, there have been no changes to these MCL-based groundwater cleanup goals since the ROD for OU-3 [U.S. Army 1996b]. Groundwater monitoring in OU-3 [FES 2015a] indicates that the three primary COCs (i.e., benzene, 1,2-dichloroethane, and 1,2-dibromoethane) generally remain above federal and state MCLs and therefore continued groundwater monitoring and ICs are necessary for the remedy to remain protective.

Soil ARAR Evaluation

The remedial action goal for in situ soils contaminated with volatile organic and petroleum compounds is the protection of groundwater. Because the soils are acting as a continuing source of contamination to groundwater, active remediation of the soils will continue until Safe Drinking Water Act levels are consistently met. Natural attenuation will continue until Alaska Water Quality Standards are achieved.

Petroleum contaminated soils that are treated ex-situ will be treated to State of Alaska Matrix Level A standards[1] before they are returned to the source area.

Although the ROD did not identify specific groundwater cleanup goals for petroleum hydrocarbons, AWQS and other applicable Alaska environmental regulations are referenced as ARARs. The ROD stated that active remediation would be used to achieve Safe Drinking Water Act levels and that natural attenuation would be used to achieve AWQS[2]. Natural attenuation will also be utilized to achieve other State of Alaska groundwater cleanup levels including diesel range organic (DRO) and gasoline range organic (GRO) concentrations.

OU-3 CONCLUSIONS

There are no newly promulgated or modified requirements of federal and state environmental laws that would change the protectiveness of the groundwater and soil remedies implemented at the Birch Hill Tank Farm (RA 1b), the Railroad Off-Loading Facility (RA 2), and Mileposts 2.7, 3.0, and 15.75 of the Fairbanks-Eielson Pipeline (RA 3) in OU-3 at Fort Wainwright.

OPERABLE UNIT 4 (OU-4)

OU-4 is comprised of two sites: Landfill and Coal Storage Yard.

Landfill (OU-4) and Coal Storage Yard (OU-4)

*The Record of Decision for Operable Unit 4, Fort Wainwright, Fairbanks Alaska [*U.S. Army 1996a] addressed potential risks to current and future hypothetical site users posed by soil and groundwater contamination.

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[1] These standards are now calculated under Method One and can be found in Table A1 in 18 AAC 75.
[2] These standards can be found in 18 AAC 70 under (5) Petroleum Hydrocarbons, Oil and Grease, for Freshwater Uses. The cleanup level for groundwater that is hydraulically connected to surface water in total aromatic hydrocarbons (TAH) is 10 µg/L and total aqueous hydrocarbons (TAqH) is 15 µg/L. Wells that are hydraulically connected to the river are only located at the Railroad Off-Loading Facility (RA 2).

RAOs for groundwater at the Landfill and Coal Storage yard, identified in Sections 5.2.1.1 and 5.2.2.1 of the ROD for OU-4 [U.S. Army 1996a] are described below.

Groundwater

- Restore groundwater to its beneficial use of drinking water quality within a reasonable time frame.
- Reduce or prevent further migration of contaminated groundwater from the sources areas;
- Prevent use of groundwater containing contaminants at levels above Safe Drinking Water Act and State of Alaska Drinking Water Standard MCLs and Alaska Water Quality Standards.
- Use natural attenuation to attain Alaska Water Quality Standards (18 AAC 70).

In addition, a RAO for soil at the Coal Storage Yard, as identified in Section 5.2.2.2 of the ROD for OU-4 [U.S. Army 1996a], was to:

- Prevent migration of soil contaminants to groundwater that could result in groundwater contamination and exceedances of federal MCLs and AWQS (18 AAC 70).

The selected remedy at the Landfill consisted of:

- Capping with engineering controls of the inactive portion of the Landfill.
- ICs to prevent the use of contaminated groundwater and restrict site access (via fencing).
- Natural attenuation to attain Alaska Water Quality Standards (AWQS).
- A phased approach, implementation of an active groundwater treatment system (Phase 2), will be considered if capping does not result in a significant reduction of groundwater contaminants when evaluated at the five-year review.

The selected remedy at the Coal Storage Yard consisted of:

- In situ soil vapor extraction and air sparging of groundwater to remove solvent contaminants to a level that attains Safe Drinking Water Act levels.
- ICs to prevent the use of contaminated groundwater and restrict site access.
- Natural attenuation to attain AWQS.

Section 5.4 of the ROD for OU-4 [U.S. Army 1996a] identified the most significant ARARs for the remedy selections for the Landfill and Coal Storage yard to be:

- ➢ Federal (40 Code of Federal Regulations [CFR] 141) and State of Alaska (18 Alaska Administrative Code [AAC] 80) Maximum Contaminant Levels (MCLs) – relevant and appropriate for groundwater and sets the active groundwater remediation goals. The Alaska Water Quality Standards (AWQS; 18 AAC 70) also apply.
- ➢ Alaska oil pollution regulations (18 AAC 75) are applicable, and Alaska guidelines for non-UST petroleum-contaminated soil are to be considered. These guidelines require cleanup of petroleum-contaminated soils to protect groundwater quality.

Groundwater ARAR Evaluation for the Landfill

Seven groundwater COCs were identified for the Landfill in Table 5-1 of the ROD [U.S. Army 1996a]: benzene, cis-1,2-dichloroethene (cis-1,2-DCE), 1,1,2,2,-tetrachloroethane, 1,1,2-trichloroethane, trichloroethene, vinyl chloride, and bis(2-ethylhexylphthalate).

Federal and State of Alaska drinking water MCLs were adopted as groundwater cleanup goals for benzene, cis-1,2-dichloroethene (cis-1,2-DCE), trichloroethene, vinyl chloride, and bis(2-ethylhexylphthalate) at the Landfill. As summarized in Table A.7-4, there have been no changes to these MCL-based groundwater cleanup goals since the ROD for OU-4 [U.S. Army 1996a]. Groundwater monitoring in OU-4 [FES 2015c], performed at the Landfill since 1997, indicates that the generally remain above federal and state MCLs and therefore continued groundwater monitoring and ICs are necessary for the remedy to remain protective.

A risk-based concentration was identified as a cleanup goal for 1,1,2,2,-tetrachloroethane and is evaluated in Attachment 8 of this Five-Year Review Report.

Groundwater ARAR Evaluation for the Coal Storage Yard

Four groundwater COCs were identified for the Coal Storage Yard in Table 5-2 of the ROD [U.S. Army 1996a]: benzene, bis(2-ethylhexylphthalate), trichloroethene (TCE), and toluene. Federal and State of Alaska drinking water MCLs were adopted as groundwater cleanup goals for these COCs. As summarized in Table A.7-4, there have been no changes to these MCL-based groundwater cleanup goals since the ROD for OU-4 [U.S. Army 1996a]. As discussed in the 2012 Monitoring Report for OU-4 [FES 2013], the Coal Storage Yard source area has been designated as a no further action (NFA) site. Therefore groundwater monitoring and ICs are no longer necessary for the remedy to remain protective.

Soil ARAR Evaluation

Four soil cleanup goals[3] for the Coal Storage Yard were identified in Table 5-2 of the ROD for OU-4 [U.S. Army 1996a]: diesel range organics (DROs), gasoline-range organics (GROs), benzene, and BTEX.

The soil remedy to prevent contaminated soil from acting as an ongoing source of contamination, is in place. Therefore, these soil cleanup goals have been achieved and only the groundwater remedy continues.

OU-4 CONCLUSIONS

There are no newly promulgated or modified requirements of federal and state environmental laws that would change the protectiveness of the groundwater and soil remedies implemented at the Landfill and Coal Storage Yard at Fort Wainwright.

OPERABLE UNIT 5 (OU-5)

*The Record of Decision for Operable Unit 5, Fort Wainwright, Fairbanks Alaska [*U.S. Army 1999] addressed potential risks to current and future hypothetical site users posed by soil and groundwater contamination and unexploded ordnance (UXO) at the following sites:

- West Section, Former Quartermaster's Fueling System (WQFS)
- East Section, Former Quartermaster's Fueling System (EQFS)
- Remedial Area 1A (RA1A)
- Open Burn/Open Detonation (OB/OD) Area

[3] These standards are now calculated under Method One and can be found in Table A1 in 18 AAC 75.

RAOs for the WQFS, EQFS, and Remedial Area 1A source areas, as defined in Section 5.2 of the ROD for OU-5 [U.S. Army 1999] are described below.

<u>Soil</u>

- Prevent the migration to groundwater of soil contaminants that could result in groundwater contamination and exceedances of federal MCLs and nonzero maximum contaminant level goals (MCLGs) and to groundwater that is closely hydrologically connected to surface water (such as the Chena River) that could result in exceedances of Alaska Water Quality Standards in surface water (EQFS and WQFS).
- Limit human health and terrestrial receptor exposure to lead-contaminated soil (RA1A).

<u>Groundwater (WQFS and EQFS)</u>

- Restore groundwater to its beneficial uses within a reasonable time frame. Reduce or prevent further migration of contaminated groundwater from the source areas to the down gradient aquifer or surface water bodies that are closely hydrologically connected by achieving MCLs (where there are no nonzero MCLGs) and Alaska Water Quality Standards. For groundwater that is hydrologically connected to surface water, Alaska Water Quality Standards will apply for the following Fresh Water Uses: (1)(A) Water Supply; (1)(B) Water Recreation; and (1)(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife.
- Ensure there is no risk to aquatic receptors through control of contaminant movement through the groundwater into the Chena River.
- Remove floating product to the extent practicable to eliminate film or sheen from groundwater.
- Prevent use of groundwater containing contaminants at levels above Safe Drinking Water Act MCLs, nonzero MCLGs, or the following Alaska Water Quality Standards for Fresh Water Uses: (1)(A) Water Supply; (1)(B) Water Recreation; and (1)(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife.

<u>Chena River Sediment and Surface Water</u>

- Reduce sources of contaminant releases to the Chena River.
- Meet the following Alaska Water Quality Standards for Fresh Water Uses: (1)(A) Water "J Supply; (1)(B) Water Recreation; and (1)(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife.
- Continue aquatic assessment.

The selected remedies for the three subareas of the WQFS consisted of:

WQFS1:

- Source area AS/SVE system, ICs, and natural attenuation of groundwater until federal and state MCLs were achieved.

WQFS2:

- Hot-spot AS/SVE system, down gradient sparge curtain and harbor boom to minimize impacts to the Chena River, ICs and monitored natural attenuation until MCLs are achieved.

WQFS3:

- Hot-spot AS/SVE system, ICs, and natural attenuation of groundwater until federal and state MCLs were achieved.

The selected remedy at the EQFS consisted of:

- Operate AS and SVE wells, ICs, and long-term monitoring and natural attenuation of groundwater COCs.

The selected remedy at Remedial Area 1A and the OB/OD Area consisted of ICs.

Section 5.3 of the ROD for OU-5 [U.S. Army 1999] identified the most significant ARARs for the remedy selections for the OU-5 source areas to be:

- ➢ Federal (40 Code of Federal Regulations [CFR] 141) and State of Alaska (18 Alaska Administrative Code [AAC] 80) Maximum Contaminant Levels (MCLs) – relevant and appropriate for groundwater that is a potential drinking water source and sets the active groundwater remediation goals. The Alaska Water Quality Standards (AWQS; 18 AAC 70) also apply to surface water, sediment, and groundwater that is closely hydrogeologically connected to surface water.
- ➢ Alaska oil pollution regulations (18 AAC 75) are applicable and require the cleanup of oil or hazardous material releases.

These significant ARARs applied to the WQFS, EQFS, and associated Chena River. In addition, a cleanup goal of eliminating sheen associated with floating-product petroleum hydrocarbons in groundwater at the WQFS and EQFS and in surface waters of the Chena River was identified in Table 12 of the ROD for OU-5 [U.S. Army 1999]. This cleanup goal was mainly based upon compliance with the AWQS (18 AAC 70). No ARARs were identified for Remedial Area 1a.

Groundwater/Surface Water ARAR Evaluation for the WQFS, EQFS, and Chena River

Table 12 of the ROD for OU-5 [U.S. Army 1999] identified:

- Six groundwater COCs for the WQFS: 1,2-dichloroethane, benzene, toluene, DRO, GRO, and residual range organics (RRO).
- Five groundwater COCs for the EQFS: 1,2-dichloroethane, toluene, trichloroethene, 1,2-dibromoethane, and bis(2-chloroethyl)ether, DRO, and RRO.
- Two surface water COCs for the Chena River: TAH and TAqH.

Federal and State of Alaska drinking water MCLs were adopted as groundwater and surface water cleanup goals for all of these COCs with the exception of bis(2-chloroethyl)ether for the EQFS, which was risk-based and is evaluated further in Attachment 8 of this Fourth-Five-Year Review Report.

As summarized in Table A.7-5, there have been no changes to these MCL-based groundwater and surface water cleanup goals since the ROD for OU-5 [U.S. Army 1999], with the exception of GRO for the WQFS. The groundwater MCL for GRO increased from 1,300 µg/L listed in the ROD for OU-5 [U.S. Army 1999] to 2,200 µg/L listed in Table C of 18 AAC 75. Groundwater monitoring in OU-5 [FES 2015b] indicates that annual groundwater monitoring should continue in the wells associated with elevated benzene, wells along the Chena River, and the WQFS DRO plume. Therefore continued groundwater monitoring and ICs are necessary for the remedy to remain protective.

A harbor and absorbent boom system was deployed each year since 1998 to contain any potential sheen in the Chena River during ice-free months (typically May-early October). The primary purpose for deploying the boom was to capture any observable sheen from residual contamination remaining along the shores of the Chena River, in accordance with the AWQS (18 AAC 70). According to the 2014 monitoring report for OU-5 [FES 2015b], the Chena River boom was deployed on May 22, 2014 with visible sheen being observed within the boom area on Nay 28, 2014. On June 20 2014, the water levels the water level in the Chena River rose so high that the boom floated off of the supports and up against the riverbank. The water levels remained high throughout the summer, and the boom could not be redeployed. Therefore, no other sheen observations could be made. The boom was removed from the riverbank on October 3, 2014. Figure 3-3 of the 2014 monitoring report [FES 2015b] indicates that although limited sheen observations could be made in 2014 due to high water levels, sheen was observed in one of four inspections between May 22, 2014 (when the boom was deployed) and June 20, 2014 (when water levels rose and displaced the boom). Additionally, Table 3-6 of the 2014 monitoring report shows that sheen observations have steadily decreased since 2012. The 2014 monitoring report indicated that the Chena River boom would be deployed in 2015 and visual observations would continue in compliance with ARARs. Continued sheen observations and deployment of the Chena River boom are necessary for the remedy to remain protective until MCLs are achieved.

<u>*Soil ARAR Evaluation*</u>

Table 12 of the ROD for OU-5 [U.S. Army 1999] identified:

- Six soil COCs for the WQFS: DRO, GRO, benzene, ethylbenzene, toluene, and xylene
- Three soil COCs for the EQFS: DRO, GRO, and xylene

No COC-specific soil cleanup goals were listed in Table 12 of the ROD for OU-5 [U.S. Army 1999], but 18 AAC 75 was listed as the basis for the cleanup goals. These soil cleanup goals applied to the active remediation of soils until contaminant levels in groundwater were consistently below state and federal MCLs. The current soil cleanup goals are listed in the Under 40 inch Zone of Table B.1 in 18 AAC 75. The soil remedy to prevent contaminated soil from acting as an ongoing source of contamination, is in place. Therefore, these soil cleanup goals have been achieved and only the groundwater remedy continues.

<u>*UXO ARAR Evaluation*</u>

The OB/OD area is a land-based unit subject to the requirements of the Resource Conservation and Recovery Act (RCRA) [i.e. 40 CFR 265, Subparts G and P]. ICs to restrict land use and access are required for the OB/OD Area as result of the regulated unit being located within an operational range, which is and will continue to be subject to the deposition of intended use munitions that may pose an explosive hazard.

Section 7.3 of the ROD required that the Army evaluate the OB/OD area no less often than during CERCLA FYRs. This evaluation was to include 1) review of the active range and any UXO within the range to determine whether ICs are sufficiently protective and 2) review of RCRA rules and regulations for military ranges and UXO to determine whether additional RCRA requirements must be met.

The Military Munitions Rule (MMR) was published in the Federal Register on 12 February 1997 as an amendment to the Resource Conservation and Recovery Act (RCRA). EPA promulgated the MMR, deciding not to impose the regulatory requirements of RCRA Subtitle C on operational military ranges. Specifically, military munitions as they relate to solid waste and their intended use, are not discarded, not solid wastes under RCRA's Subtitle C regulations, and consequently not regulated as hazardous waste[4].

The MMR states that military munitions are not a solid waste for regulatory purposes (1) when a munition is used for its intended purpose, which includes when a munition is used for the training of military personnel and of explosives and emergency response specialists: when a munition is used for research, development, testing and evaluation; and when a munition is destroyed during certain range clearance operations; and (2) when an unused munition, including components thereof, is repaired, reused recycled, reclaimed or disassembled reconfigured, or otherwise subjected to materials recovery activities.

The MMR was issued prior to the OU-5 ROD [U.S. Army 1999]. The range has not been closed and will continue to be used as operational range into the reasonably anticipated future. The OB/OD area continues to be subject to deposition of munitions and munitions constituents, and the delay of closure of the OU-5 OB/OD unit continues to be appropriate.

On September 30, 2013, EPA issued a RCRA B Permit that became effective on November 15, 2013 and will remain in effect until November 14, 2023. The permit contained requirements for closure of the OB/OD area, which would not go into effect until the small-arms impacted range closes, in accordance with the closure performance standard, and procedures for amendment of the closure plan and notification and completion of closure. Per Part II.B of the permit, the Army is required to submit to the EPA, for review and approval, a revised closure plan at least 90 days (1) prior to the date when the use of the Range will cease, or (2) after a request from the Administrator. The revised closure plan must meet the requirements of RCRA [40 CFR 264.111 through 116]. In accordance with the permit, EPA requested a revised closure plan for the OB/OD Area on December 18, 2014. Therefore, the Army was required to submit a revised closure plan to EPA for review and approval on March 18, 2015 [i.e. 90 days from the request on December 18, 2014]. To date, EPA has yet to receive a revised closure plan for the OB/OD area.

No new RCRA or munitions' rules have been promulgated that would change the unregulated status of intended use munitions or UXO on the operational range. Additionally, there are no additional RCRA or munitions' rules that must be met specific to post-closure procedures for former OB/OD areas.

OU-5 CONCLUSIONS

There are no newly promulgated or modified requirements of federal and state environmental laws that would change the protectiveness of the groundwater, soil, or UXO remedies implemented in the OU-5 source term areas.

[4] Reference: RCRA [40 CFR 266.202] – Definition of Solid Waste

OPERABLE UNIT 6 (OU-6)

*The Record of Decision for Operable Unit 6, Former Communications Site, Fort Wainwright, Alaska [*U.S. Army 2014] addressed potential risks to current and future hypothetical site users posed by soil and groundwater contamination at Former Communications Site (FCS).

RAOs for the FCS, as defined in Section 1.4 of the ROD for OU-6 [U.S. Army 2014] are described below.

- Protect against human exposure to COCs in soil.
- Protect against human exposure to COCs in groundwater.
- Return groundwater to its beneficial use as a drinking water source.

The selected remedy for the FCS consisted of groundwater sampling to monitor the progress of natural attenuation and ensure that contamination is not migrating toward the Post drinking water supply wells, and ICs that prohibit:

- excavation and removal of soil from the FCS without permission of the U.S. Army Department of Public Works (DPW) and concurrence of USEPA and the Alaska Department of Environmental Conservation (ADEC); and
- on-site groundwater use to eliminate human exposure to COCs.

Table B-1 of the ROD for OU-6 [U.S. Army 2014] identified the following chemical-specific ARARs for OU-6.

- ➢ Federal (40 Code of Federal Regulations [CFR] 141) Maximum Contaminant Levels (MCLs) – applicable for groundwater that is a potential drinking water source and sets the MCL for TCE.
- ➢ Alaska oil pollution regulations (18 AAC 75) are relevant and appropriate for groundwater that is a potential drinking water source and establishes groundwater cleanup goals for DRO, RRO, and 1,2,3-TCP.

Soil cleanup goals for two of the COCs listed in Table 1 of the ROD for OU-6 [U.S. Army 2014] (i.e. aluminum and manganese) were risk-based. A review of toxicity and risk assessment methodology changes to these risk-based groundwater cleanup goals is included in Attachment 8 of this Five-Year Review Report.

Groundwater ARAR Evaluation for the FCS

Table 2 of the ROD for OU-6 [U.S. Army 2014] identified four groundwater COCs for the FCS; 1,2,3-trichloropropane (1,2,3-TCP), DRO, RRO, and TCE. Federal and State of Alaska drinking water MCLs were adopted as groundwater cleanup goals for all of these COCs.

As summarized in Table A.7-6, there have been no changes to these MCL-based groundwater cleanup goals since the ROD for OU-6 [U.S. Army 2014]. Groundwater monitoring in OU-6 [U.S. Army 2004] indicates that biannual groundwater monitoring should continue in FCS wells associated with elevated 1,2,3-TCP, DRO, and RRO. Therefore continued groundwater monitoring and ICs are necessary for the remedy to remain protective.

Soil ARAR Evaluation

Table 1 of the ROD for OU-6 [U.S. Army 2014] identified five soil COCs for the FCS; 1,2,3-TCP, DRO, aluminum, copper, and manganese. Risk-based concentrations were identified as soil cleanup goals for aluminum and manganese and are evaluated in Attachment 8 of this Five-Year Review Report.

Soil cleanup goals for 1,2,3-TCP, DRO, and copper were based upon ADEC direct contact or inhalation risk-based cleanup levels listed in the Under 40 inch Zone of Tables B1 and B2 of 18 AAC 75. The selected remedy for FCS soil consisted of institutional controls to address risks associated with subsurface soil (i.e. greater than 6 inches in depth) contamination remaining at the FCS. These soil cleanup goals act to define the boundary where ICs apply to restrict the digging and removal of soil in a defined area (highlighted in Figure A-25 of the ROD for OU-6).

As summarized in Table A.7-6, there have been no changes to ADEC-based soil cleanup goals since the ROD for OU-6 [U.S. Army 2014] for 1,2,3-TCP and DRO. The ADEC-based soil cleanup goal for copper slightly decreased from 4,160 mg/kg [ROD for OU-6] to 4,100 mg/kg [Table B1 of 18 AAC 75 - revised as of May 8, 2016]. Since COCs remain in subsurface soil above the soil cleanup goals listed in Table 1 of the ROD for OU-6, continued ICs to restrict digging and removal of soil in these areas are required for the remedy to remain protective.

OU-6 CONCLUSIONS

There are no newly promulgated or modified requirements of federal and state environmental laws that would change the protectiveness of the soil or groundwater remedy implemented in OU-6.

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FES 2015b. *Draft 2014 Monitoring Report. Operable Unit 5, Fort Wainwright*, Alaska, June.

FES 2015c. *Draft 2014 Annual Sampling Report. Operable Unit 4, Fort Wainwright*, Alaska, June.

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U.S. Army 1997a. *The Record of Decision for Operable Unit 2, Fort Wainwright, Fairbanks Alaska*, January.

U.S. Army 1996a. *The Record of Decision for Operable Unit 4, Fort Wainwright, Fairbanks Alaska,* August.

U.S. Army 1996b. *The Record of Decision for Operable Unit 3, Fort Wainwright, Fairbanks Alaska*, June.

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Table A.7-1: Remediation Goals for Chemicals of Concern in Operable Unit 1								
Fort Wainwright, Fairbanks, Alaska								
OU	**Site Description**	**Media of Concern**	**Contaminant of Concern**	**Remediation Goal[1]**	**Units**	**Basis[2,3]**	**Current Remediation Goal**	**Cleanup Goal Change?[4]**
1	801 Drum Burial Site	Groundwater	Aldrin	0.004	µg/L	RBC	0.05	-
			Dieldrin	0.004	µg/L	RBC	0.05	-
			1,1-Dichloroethene	7	µg/L	MCL	7	No
			Benzene	5	µg/L	MCL	5	No
			Vinyl Chloride	2	µg/L	MCL	2	No
			DRO[5]	**15**	µg/L	**ARAR[6]**	**1500**	**Yes**
			cis-1,2-dichloroethene	not listed in ROD	µg/L	MCL	70	-
		Surface and Subsurface Soil	Aldrin	3.8	mg/kg	RBC	0.3	-
			Dieldrin	4	mg/kg	RBC	0.32	-
			DRO[5]	**200**	**mg/kg**	**ARAR[6]**	**250**	**Yes**

DRO - diesel range organics
MCL - maximum contaminant level
mg/kg – milligrams per kilogram
OU – operable unit
RBC – risk-based concentration
ROD – record of decision
µg/L – micrograms per liter

[1] Table 7-1 of the *Record of Decision for Operable Unit 1, Fort Wainwright, Fairbanks Alaska* (U.S. Army 1997)

[2] Maximum Contaminant Levels (MCLs) from the National Drinking Water Regulations (40 CFR 14.61) and 18 AAC 75 Table C for groundwater; cleanup levels for migration-to-groundwater in the under 40-inch zone from 18 AAC 75 Table B1 for soils.

[3] Risk for groundwater COCs is based upon Federal or State of Alaska drinking water MCLs or an excess lifetime cancer risk of $1x10^{-4}$ for residential exposure scenario. Risk for soil COCs is based upon an excess lifetime cancer risk of 1x10-6 for residential exposure scenario.

[4] A review of toxicity and risk assessment methodology changes to the listed RBCs is included in Attachment 8 of this Five-Year Review Report.

[5] Note in Table 7-1 of the OU-1 ROD stated that "Diesel-range organics will be cleaned up to levels consistent with proposed State of Alaska regulations (18 AAC 75). Preliminary remediation goals for DRO in soil and groundwater were listed in Table 2-1 of the Feasibility Study for OU-1 (USACE 1997).

[6] The current State of Alaska DRO soil cleanup level for migration-to-groundwater in the under 40-inch zone can be found in Table B2 of 18 AAC 75 (revised as of May 8, 2016) and DRO groundwater cleanup level can be found in Table C of 18 AAC 75.

Table A.7-2: Remediation Goals for Chemicals of Concern in Operable Unit 2 Fort Wainwright, Fairbanks, Alaska								
OU	**Site Description**	**Media of Concern**	**Contaminant of Concern**	**Remediation Goal[1]**	**Units**	**Basis[2]**	**Current MCL**	**Cleanup Goal Change?**
2	DRMO Yard	Groundwater	Benzene	5	µg/L	Primary MCL, 18 AAC 80	5	No
			Trichloroethene	5	µg/L	Primary MCL, 18 AAC 80	5	No
			Tetrachloroethene	5	µg/L	Primary MCL, 18 AAC 80	5	No
			Vinyl chloride	2	µg/L	Primary MCL, 18 AAC 80	2	No
			1,1-DCE	7	µg/L	Primary MCL, 18 AAC 80	7	No
			cis-1,2-DCE	70	µg/L	Primary MCL, 18 AAC 80	70	No
	Bldg 1168 Leach Well	Groundwater	Benzene	5	µg/L	Primary MCL, 18 AAC 80	5	No
			Trichloroethene	5	µg/L	Primary MCL, 18 AAC 80	5	No
			Tetrachloroethene	5	µg/L	Primary MCL, 18 AAC 80	5	No
			Vinyl chloride	2	µg/L	Primary MCL, 18 AAC 80	2	No
			1,1-DCE	7	µg/L	Primary MCL, 18 AAC 80	7	No
			cis-1,2-DCE	70	µg/L	Primary MCL, 18 AAC 80	70	No

MCL - maximum contaminant level

OU – operable unit

µg/L – micrograms per liter

[1] Sections 7.1.2.1 and 7.2.3 of the *Record of Decision for Operable Unit 2, Fort Wainwright, Fairbanks Alaska* (U.S. Army 1997)

[2] Maximum Contaminant Levels (MCLs) from the National Drinking Water Regulations (40 CFR 14.61) and Table C of 18 AAC 75 (revised as of May 8, 2016) for groundwater.

Table A.7-3: Remediation Goals for Chemicals of Concern in Operable Unit 3 Fort Wainwright, Fairbanks, Alaska								
OU	**Site Description**	**Media of Concern**	**Contaminant of Concern**	**Remediation Goal[1]**	**Units**	**Basis[2]**	**Current MCL**	**Cleanup Goal Change?**
3	All	Groundwater	Benzene	5	µg/L	Primary MCL, 18 AAC 80	5	No
			Toluene	1,000	µg/L	Primary MCL, 18 AAC 80	1,000	No
			Ethylbenzene	700	µg/L	Primary MCL, 18 AAC 80	700	No
			1,2-Dibromoethane (EDB)	0.05	µg/L	Primary MCL, 18 AAC 80	0.05	No
			1,2-Dichloroethane (DCA)	5	µg/L	Primary MCL, 18 AAC 80	5	No
			1,2,4-Trimethylbenzene[3]	1850	µg/L	RBC	-	-
			1,3,5-Trimethylbenzene[3]	1850	µg/L	RBC	-	-

MCL - maximum contaminant level RBC - risk-based concentration

OU – operable unit µg/L – micrograms per liter

[1] Section 7.3.1 of the *Record of Decision for Operable Unit 3, Fort Wainwright, Fairbanks Alaska* (U.S. Army 1996)

[2] Maximum Contaminant Levels (MCLs) from the National Drinking Water Regulations (40 CFR 14.61) and Table C of 18 AAC 75 (revised as of May 8, 2016) for groundwater.

[3] The remediation goals listed in Section 7.3.1 of the Record of Decision for OU-3 (U.S. 1996) were corrected to 1.85 mg/L in Section 2.3 of the Explanation of Significant Differences for OU-3 (U.S. Army 2002).

Table A.7-4: Remediation Goals for Chemicals of Concern in Operable Unit 4
Fort Wainwright, Fairbanks, Alaska

OU	Site Description	Media of Concern	Contaminant of Concern	Remediation Goal[1]	Units	Basis[2]	Current MCL	Cleanup Goal Change?
4	Landfill	Groundwater	Benzene	5	µg/L	Primary MCL, 18 AAC 80	5	No
			cis-1,2-Dichloroethane	70	µg/L	Primary MCL, 18 AAC 80	70	No
			1,1,2-Trichloroethane	5	µg/L	Primary MCL	5	No
			1,1,2,2-Tetrachloroethane	5.2	µg/L	RBC	4.3	-
			Trichloroethene	5	µg/L	Primary MCL, 18 AAC 80	5	No
			Vinyl chloride	2	µg/L	Primary MCL, 18 AAC 80	2	No
			Bis(2-Ethylhexyl)phthalate	6	µg/L	Primary MCL, 18 AAC 80	6	No
	Coal Storage Yard	Groundwater	Benzene	5	µg/L	Primary MCL, 18 AAC 80	5	No
			Bis(2-Ethylhexyl)phthalate	6	µg/L	Primary MCL, 18 AAC 80	6	No
			Trichloroethene	5	µg/L	Primary MCL, 18 AAC 80	5	No
			Toluene	1,000	µg/L	Primary MCL, 18 AAC 80	1,000	No

MCL - maximum contaminant level
RBC - risk-based concentration
OU – operable unit
µg/L – micrograms per liter

[1] Tables 5-1 and 5-2 of the *Record of Decision for Operable Unit 4, Fort Wainwright, Fairbanks Alaska* (U.S. Army 1996)

[2] Maximum Contaminant Levels (MCLs) from the National Drinking Water Regulations (40 CFR 14.61) and Table C of 18 AAC 75 (revised as of May 8, 2016) for groundwater.

Table A.7-5: Remediation Goals for Chemicals of Concern in Operable Unit 5 Fort Wainwright, Fairbanks, Alaska								
OU	**Site Description**	**Media of Concern**	**Contaminant of Concern**	**Remediation Goal[1]**	**Units**	**Basis[2]**	**Current MCL**	**Cleanup Goal Change?**
5	WQFS	Groundwater	1,2-Dichloroethane	5	µg/L	Primary MCL, 18 AAC 80	5	No
			Benzene	5	µg/L	Primary MCL, 18 AAC 80	5	No
			Toluene	1,000	µg/L	Primary MCL, 18 AAC 80	1,000	No
			Diesel Range Organics	1,500	µg/L	18 AAC 75, Table C	1,500	No
			Gasoline Range Organics	**1,300**	**µg/L**	**18 AAC 75, Table C**	**2,200**	**Yes**
			Residual Range Organics	1,100	µg/L	18 AAC 75, Table C	1,100	No
	EQFS	Groundwater	1,2-Dichloroethane	5	µg/L	Primary MCL, 18 AAC 80	5	No
			Toluene	1,000	µg/L	Primary MCL, 18 AAC 80	1,000	No
			Trichloroethene	5	µg/L	Primary MCL, 18 AAC 80	5	No
			1,2-Dibromoethane	0.05	µg/L	Primary MCL, 18 AAC 80	0.05	No
			bis(2-chloroethyl)ether	0.0092	µg/L	RBC	0.77	-
	Chena River	Surface Water	Total Aromatic Hydrocarbon	10	µg/L	Clean Water Act and 18 AAC 70	10	No
			Total Aqueous Hydrocarbon	15	µg/L	Clean Water Act and 18 AAC 70	15	No

MCL - maximum contaminant level RBC - risk-based concentration

OU – operable unit µg/L – micrograms per liter

[1] Table 12 of the *Record of Decision for Operable Unit 5, Fort Wainwright, Fairbanks Alaska* (U.S. Army 1999)

[2] Maximum Contaminant Levels (MCLs) from the National and State Drinking Water Regulations (40 CFR 14.61 and 18 AAC 80) and Table C of 18 AAC 75 (revised as of May 8, 2016) for groundwater.

Table A.7-6: Remediation Goals for Chemicals of Concern in Operable Unit 6 Fort Wainwright, Fairbanks, Alaska								
OU	**Site Description**	**Media of Concern**	**Contaminant of Concern**	**Remediation Goal (RD)[1]**	**Units**	**Basis[2]**	**Current RG**	**RG Change?**
6	FCS	Soil	1,2,3-Trichloropropane (1,2,3-TCP)	0.17	mg/kg	18 AAC 75, Table B1	0.17	No
			Diesel Range Organics (DRO)	10,250	mg/kg	18 AAC 75, Table B2	10,250	No
			Aluminum	77,000	mg/kg	RBC	-	-
			Copper	**4,160**	**mg/kg**	**18 AAC 75, Table B1**	**4,100**	**Yes**
			Manganese	1,800	mg/kg	RBC	-	-
		Groundwater	1,2,3-Trichloropropane (1,2,3-TCP)	0.12	µg/L	18 AAC 75, Table C	0.12	No
			Diesel Range Organics (DRO)	1,500	µg/L	18 AAC 75, Table C	1,500	No
			Residual Range Organics (RRO)	1,100	µg/L	18 AAC 75, Table C	1,100	No
			Trichloroethene (TCE)	5	µg/L	Primary MCL	5	No

FCS - Former Comminucations Site
OU – operable unit
MCL - maximum contaminant level
µg/L – micrograms per liter

[1] Table 1 (soil) and Table 2 (groundwater) of the *Record of Decision for Operable Unit 6, Former Communications Site, Fort Wainwright, Alaska* (U.S. Army 2014)

[2] Maximum Contaminant Levels (MCLs) from the National and State Drinking Water Regulations (40 CFR 14.61) and Tables B1 and B2 (soil) and Table C (groundwater) of 18 AAC 75 (revised as of May 8, 2016).

ATTACHMENT 8

Risk Assessment and Toxicology Evaluation

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Risk Assessment and Toxicology Evaluation

This evaluation was prepared to address Question B of the statement of service, *"Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives (RAOs) used at the time of the remedy selection still valid?"*

This is the fourth five year review report for Operable Units (OU's) 1, 2, 3, 4, and 5 at Fort Wainwright Alaska (FWA). Previous five year reviews did not explicitly evaluate changes in the exposure assumptions, toxicity data, and associated risk-based cleanup levels; this is the first time this level of review is completed.

Note that for all of the OUs, older exposure factor values were utilized in assessing risk than what is currently recommended by the USEPA (USEPA 2014). However, the newly recommended exposure parameter values are generally less conservative than what was used in the past, and would not affect the protectiveness of the remedy. Therefore, this review will focus on aspects of updates to risk assessment methodology and toxicity criteria changes that may have occurred that could affect the protectiveness of the remedy.

Most of the cleanup goals for FWA are based on applicable or relevant and appropriate regulations (ARARs). The review of ARAR-based changes and related potential effects on cleanup goals is provided in Attachment 7. By definition, an ARAR-based cleanup goal is deemed protective. However, a review of changes to toxicity criteria is provided for all human health constituents of concern (COC). Table A.8-1 indicates whether or not there have been recent changes to toxicity criteria for each COC. For compounds that have risk-based cleanup goals, additional discussion of any toxicity criteria changes and effects on cleanup goals are discussed in conjunction with the OU-specific sections below.

For the eight compounds which have ARAR-based cleanup goals and recent toxicity changes, Table A.8-2 is presented which compares how those recent toxicity changes would translate into risk-based screening levels (use of the updated toxicity criteria by USEPA to develop risk-based concentrations for tapwater) vs. current ARAR-based cleanup levels. As indicated in Table A.8-2, the tapwater risk-based concentrations (developed within the acceptable cancer risk range and/or an acceptable hazard index of 1 for non-carcinogenic health effects) would be greater than the ARAR-based cleanup level (MCL) for six compounds. This indicates that the ARAR-based cleanup goal remains protective at those risk targets. For the other two compounds (trichloroethene and cis-1,2-dichloroethene), the non-cancer risk-based concentration for tapwater is slightly lower than the ARAR-based cleanup goal[1]. However, as the tapwater hazard index for each of these compounds would still approach 1 (e.g., be below 2) if the tapwater concentration equaled the MCL (5 ppb for TCE and 70 ppb for cis-1,2-DCE), the MCL remains protective, given the uncertainties surrounding both the toxicity assessments and the generic exposure assessments used in this risk characterization. A site-specific assessment for current exposures would indicate acceptable risk, as the on-site groundwater is not currently used for drinking water purposes. Regarding uncertainties in the toxicity assessments for these compounds, for TCE, the tapwater risk-based concentration is driven by the inhalation route for non-cancer health effects. Composite uncertainty factors of 10 and 100 were applied in developing the inhalation reference concentration for TCE (USEPA 2011). For cis-1,2-DCE, the tapwater risk-based concentration is driven by the ingestion route for non-cancer health effects.

[1] The TCE MCL became effective in 1989, and the MCL for cis-1,2-DCE became effective in 1992.

A composite uncertainty factor of 3,000 was applied to the oral reference dose for cis-1,2-DCE (USEPA 2010). Comparisons of current vs. previous toxicity criteria factors for TCE and cis-1,2-DCE are provided in Table A.8-3. A re-evaluation of the cleanup goals for TCE and DCE is not warranted until such a time that the ARAR itself may be revised.

One risk assessment methodology change that has occurred since the RODs were signed for OU's 1, 2, 3, 4, and 5 is an update to guidance concerning the vapor intrusion pathway (USEPA 2015b, 2016a; ADEC 2012). In the latest guidance, the U.S. Environmental Protection Agency (USEPA) recommends that all volatile constituents be evaluated for their potential to pose vapor intrusion risks when they are found in the subsurface below or near occupied buildings. In addition, conservative media-specific vapor intrusion screening levels (VISLs) have been developed by both the USEPA and the Alaska Department of Environmental Conservation (ADEC) to assist in identifying sites that warrant further evaluation of the vapor intrusion pathway. In some instances, the most conservative and generic VISLs for identifying volatile constituents in groundwater that may pose vapor intrusion risks that are lower than the USEPA's maximum contaminant level (MCL) for drinking water. In its latest guidance on the vapor intrusion pathway, the USEPA recommends that *"When groundwater is the subsurface vapor source, USEPA generally recommends comparing groundwater concentrations to the VISLs to estimate the boundaries of the plume, when contaminated groundwater is a subsurface vapor source, for purposes of establishing the boundaries of the vapor intrusion inclusion zone"* (USEPA 2015b). To clarify, the USEPA notes that, *"Among other possibilities, vapor intrusion impacts observed to occur at distances greater than 100 feet in the absence of a preferential migration route(s) may reflect imprecision in the interpolated edge of a plume, based upon sampling data from sparse monitoring wells, and/or use of screening levels for drinking water, rather than for vapor intrusion (i.e., vapor intrusion screening level, VISL), to delineate a plume's extent."* The USEPA developed a calculator that can be used to update the VISL using latest toxicity parameters for constituents; it can be modified to reflect site-specific groundwater temperature that will affect the volatilization rate of constituents from groundwater to air inside a building (USEPA 2016a). Table A.8-4 compares the USEPA's groundwater VISL (developed assuming a groundwater temperature of 5 degrees Celsius [ºC], which is an approximate average groundwater temperature at FWA) and the ADEC generic groundwater VISL. Groundwater MCLs, which were used as cleanup goals in the RODs, are provided for comparison in Table A.8-4.

The following sections review the exposure assumptions, toxicity data, cleanup levels and remedial action objectives (RAOs) at each OU. The USEPA's current VISLs are used to evaluate potential vapor intrusion risks because these potential exposures were not evaluated according to the USEPA's latest guidance on vapor intrusion at the time of remedy selection.

OU-1

Human Health

The OU-1 ROD was signed in 1997 and addressed soil and groundwater contamination. It contains a thorough summary of the earlier baseline risk assessment that was performed for the site. The RAOs from the ROD were designed to:

- Ensure that groundwater meets state and federal drinking water standards.
- Prevent buried drums and contaminated soil from continuing to act as a source of groundwater contamination.

- Reduce risks associated with exposure to contaminants in drums and soil.
- Minimize potential contaminant migration to the Chena River and downgradient drinking water wells.

The cleanup goals for soil and groundwater established in the ROD were reviewed to determine if there have been any changes in exposure assumptions, toxicity data, and/or risk-based cleanup levels that would affect the protectiveness of the remedy. Some of the cleanup goals were based on drinking water regulations (e.g., the cleanup goals for 1,1-dichloroethene, benzene, and vinyl chloride in groundwater), but others (aldrin and dieldrin in soil and groundwater) were based on the site-specific risk assessment, as no regulations were in place at the time of the ROD. Any changes in the regulations that would affect the cleanup goals are reviewed in Attachment 7.

Table A.8-5 presents the risk-based cleanup goals for aldrin and dieldrin that were established in the 1997 ROD, as well as the current USEPA risk based screening levels (USEPA 2015c). Table A.8-5 also indicates that the toxicity criteria used to develop risk-based cleanup goals for aldrin and dieldrin have not changed since the late 1980's. Any USEPA-recommended changes in the risk-based cleanup goals that are shown in Table A.8-5 for these two pesticides are therefore a result of evolving guidance regarding exposure assumptions (e.g., updates to recommended default exposure parameters, USEPA 2014a) as well as risk characterization for both the dermal and inhalation exposure pathways (USEPA 2004 and 2009a). The original exposure assumption used in the 1997 ROD assumed a residential soil exposure frequency of 200 days per year, instead of the USEPA default 350 days per year, because the ground would be frozen and/or snow covered for the remaining period. (This is approximately five months of snow covered/frozen ground per year.) This exposure assumption is still valid. The currently recommended USEPA generic risk-based screening levels for aldrin and dieldrin for both soil and groundwater were adjusted by a factor of 350/200 to make this Alaska-specific adjustment to the risk-based screening level. The current Alaska-adjusted USEPA risk based screening levels are comparable to, or slightly greater than, the soil and groundwater risk-based cleanup goals identified in the ROD. Therefore, the cleanup goals continue to be protective for direct exposure to aldrin and dieldrin in soil and groundwater.

The ROD stated that current and future land uses at the 801 Drum Burial Site are recreational due to the site's proximity to the Chena River (contamination is located on the flood plain). This still appears to be the case, as the land directly over the 801 Drum Burial Site remains vacant and the 801 Military Housing Area is directly across River Road from the site. Therefore, there is limited exposure to soil at this location. In addition, maximum detected concentrations of aldrin and dieldrin in surface soil samples taken in the 1996 RI and Supplemental Investigation Report (1997) are generally below the risk-based concentrations that were identified as cleanup goals protective of direct soil contact exposures in the ROD (Table A.8-5). Consequently, the remedy remains protective of direct contact soil exposures.

In 2004, a Cleanup Operations and Site Exist Strategy (CLOSES) evaluation for the 801 Drum Burial Site was prepared (CH2M HILL 2004b). The goal of CLOSES evaluation was a comprehensive assessment of monitoring data using diagnostic tools to develop cost-effective system operation and maintenance strategy. This report provided the following observations:

- The soil source was mostly removed and residual soil contamination is all that remains.
- All of the drums have been removed; this is supported by the results of multiple geophysical surveys and removal actions.

- Remaining contamination at the site is limited to residual soils left after the removal actions. Soil samples have not been collected since the excavation and drum removal activities in 1995 and 1996. Therefore, it is not possible to determine whether soil concentrations within the source area have decreased since these remedial activities. However, removal of the drums and contaminated soils suggest that the majority of the soil within the source was removed during these activities.
- Based on these determinations, the RAOs for the site have been met as best as practicable. Although there continue to be exceedances in groundwater, this is due to residual soils that were left after the removal actions.

Groundwater wells that supply drinking water for the Golden Heart Utilities water system (which supplies water to the 801 Military Housing Area – currently designated as the Birchwood Housing Area) and the City of Fairbanks are located downgradient of the site. Institutional controls are in place to ensure that groundwater wells are not installed on the site for drinking water purposes. Perimeter monitoring wells do not indicate that contaminants are migrating from the source area to the Chena River or to the 801 Military Housing Area.

Section 5.3 of the ROD indicates that the soil cleanup goals are considered to be protective of groundwater quality *"based on the fate and transport model conducted by the United States EPA"*. No further information regarding this fate and transport modeling is provided in the ROD.

One pathway that was not explicitly evaluated at the time of the ROD, nor during subsequent monitoring, is the vapor intrusion pathway. Groundwater beneath the 801 Drum Burial Site flows towards the housing area at least some times during the year (groundwater flow direction is affected seasonally by the river stage). The depth to groundwater is approximately 5 to 15 feet below ground surface. According to the USEPA's latest guidance for assessing the vapor intrusion pathway from subsurface vapor source to indoor air, all constituents that are volatile must be evaluated for the potential to cause a complete exposure the vapor intrusion pathway. All of the OU-1 COCs are considered volatile with the exception of dieldrin, although inhalation pathway toxicity criteria are not available for all of the volatile organic compounds (VOCs). The 801 Military Housing Area is the only potential receptor under the vapor intrusion pathway. Table A.8-6 compares the 2015 groundwater sampling results to VISLs developed by the USEPA and ADEC (USEPA 2016a, ADEC 2012, FES 2015c). It shows that only 1,2,4-trimethylbenzene (TMB) detected in wells AP-6327 and AP-1010 exceeds the USEPA VISL. Benzene concentrations in these wells exceed the ADEC VISL, but not the more recently developed USEPA VISL. Well AP-6326 is closer to the 801 housing development than well AP-6327, and at that well location, neither of those VOCs exceed either the USEPA or the ADEC VISLs. At well AP-6326, the reported concentration of cis-1,2-dichloroethylene (cis-1,2-DCE) exceeds the ADEC VISL. The USEPA does not have a corresponding VISL for cis-1,2-DCE due to the lack of a USEPA-approved inhalation toxicity criteria for this compound. This footnote appears to Appendix D, Target Levels for Indoor Air in the ADEC's VI Guidance 2012: *"DEC generally calculates indoor air target levels based on the methods, toxicity information, and exposure parameters provided in the USEPA Regional Screening Levels. However, DEC also calculated target levels for a few compounds not addressed by the USEPA. For chemical-specific information regarding calculation of the indoor air target levels, contact DEC"*. The USEPA's 2010 toxicological review of cis-1,2-DCE indicates that, *"There are no human, chronic, or subchronic inhalation studies for cis-1,2-DCE. The inhalation toxicity database for* *cis-1,2-DCE is limited to an acute study performed in 1999 in male and female rats... Therefore, in the absence of repeat-dose toxicity studies, the available inhalation data for cis-1,2-DCE do not support derivation of an RfC. An inhalation assessment for cis-1,2-DCE was not previously developed for the IRIS database"* (USEPA 2010). Furthermore, the USEPA 2015 RSL table does not provide an indoor air RSL for cis-1,2-DCE, as no toxicity criteria from any of the USEPA-approved three tiers of toxicity criteria are provided (USEPA 2015c, 2003b). Without further information from ADEC, the derivation of a VISL for 1,2-cis-DCE cannot be verified. The lack of verifiable toxicity criteria for the inhalation pathway for 1,2-cis-DCE indicates that risks cannot be quantified for this pathway for this compound. In addition, as stated above, no VOCs exceed USEPA VISL at well AP-6326, which is the closest well to the housing development.

Because the housing development is downgradient of groundwater that contains elevated VOCs in wells AP-6326 and AP-6327, and the full nature and extent of groundwater contamination in this area does not appear to be well defined from the groundwater results provided in the last five years (e.g., wells that surround wells AP-6326 and AP-6327 have not been sampled for VOCs in the past 10 years), there is uncertainty whether or not a vapor intrusion issue is present in the 801 Military Housing Area. The nearest building to well AP-6326 appears to be approximately 220 feet away. Since neither of the wells on the west side of River Road (i.e. closer to the housing units) were sampled for VOCs in 2015, it is recommended that future sampling events include analysis of samples obtained from AP10042-MW and AP-7162 for VOCs.

Significant Finding

For the two constituents that have risk-based cleanup goals, the exposure assumptions, toxicity criteria, and RAOs used at the time of the remedy are still valid.

Ecological

The main source area addressed under the 801 Drum Burial Site is within the 100-year floodplain of the Chena River. No threatened or endangered species reside in the area. The screening level ecological risk assessment concluded that surface soil exposure is not likely to pose a significant risk to small mammals at the site. It also concluded that burrowing animals are not exposed to risk at the site.

Results of the Chena River surface water and sediment screening suggest that these media do not pose an unacceptable risk to aquatic ecological receptors. This ecological issue will be further discussed in conjunction with OU-5.

OU-2

Human Health

The OU-2 ROD was signed in 1997. It addressed soil and groundwater contamination at two areas with OU-2, the Building 1168 Leach Well site and the Defense Reutilization Maintenance (DRMO) Yard. The ROD contains a thorough summary of the earlier baseline risk assessment that was performed for the site. The RAOs in the ROD were established to:

- Restore groundwater to drinking water quality.
- Prevent further leaching of contaminants into groundwater.
- Reduce of prevent further off-site migration of contaminated groundwater.

- Prevent use of groundwater above federal Safe Drinking Water Act and State of Alaska Drinking Water Standards MCLs.

A baseline risk assessment for the site evaluated potential residential and industrial exposures directly to contaminated soil and groundwater at OU-2. An evaluation of applicable or relevant and appropriate requirement (ARAR)-based cleanup goals for OU-2 is provided in Attachment 7; none of the cleanup goals are risk-based. Although the RAOs used at the time of the remedy selection remain valid, the exposure assumptions utilized at the time of the ROD did not consider the vapor intrusion pathway.

The Building 1168 leach well area is situated between two housing developments; the Birchwood Homes housing area is located directly south of Building 1168 and the Sitku Basin housing area is located directly to the north of Building 1168. Groundwater flow is generally to the northwest in this area, although flow direction fluctuations do occur. The latest groundwater monitoring data (FES 2014b) were compared to VISLs developed by the USEPA and ADEC (Table A.8-7). Although one of the groundwater samples collected from well PS-23 in 2010 had a benzene concentration that slightly exceeded the ADEC's VISL, the current USEPA VISL for 5^{o}C groundwater was not exceeded. None of the groundwater samples exceeded VISL for any other constituents of concern (COCs) in the area.

The DMRO Yard consists of some actively used commercial buildings (Building 5010). Groundwater monitoring results presented in the draft 2014 monitoring report (FES 2014b) were compared to VISL in Table A.8-8. None of the samples obtained in OU-2 since 2009 exceed any of the VISLs. Furthermore, there are no currently occupied buildings near well PO5 and the downgradient and upgradient wells (Probe B and AP-8916, respectively) do not contain trichloroethene (TCE) above its VISL. Therefore, vapor intrusion should not be a concern anywhere in OU-2.

Significant Finding

The RAOs and exposure assumptions used at the time of the remedy selection remain valid. The 1994 – 1997 soil sampling from the Building 1168 Leach Well indicated that the soil source term was decreasing as a result treatment by an air sparge/soil vapor extraction (AS/SVE) system (CH2M HILL 2003). Although the vapor intrusion pathway was not explicitly evaluated at this OU at the time of the ROD, the current concentrations of VOCs in groundwater do not exceed the VISLs and vapor intrusion should not be a concern at commercial buildings in DMRO Yard or at the neighboring residential housing units.

Ecological

A screening level ecological risk assessment was performed for OU-2. It indicated that no complete ecological exposure pathways existed at the Building 1168 Leach Well site. Although the DMRO Yard source area is an industrial area, potential ecological risks were evaluated. The ecological risk assessment concluded that overall, there do not appear to be unacceptable potential ecological risks associated with the DRMO Yard source area.

OU-3

Human Health

The OU-3 RAO's were established in a 1996 ROD and confirmed in a 2002 Explanation of Significant Differences (ESD).

Groundwater

- Restore to drinking water quality within a reasonable time.
- Reduce further migration of contaminated groundwater.
- Prevent use when concentrations exceed Safe Drinking Water Act levels.

Soil

- For petroleum-contaminated soil, prevent migration of contaminants from soil into groundwater that would result in groundwater contamination and exceedance of Safe Drinking Water Act standards.

Review of risk-based cleanup goals for TMBs: The cleanup goals for soil and groundwater established in the 1996 ROD and 2002 ESD were reviewed to determine if there have been any changes in exposure assumptions, toxicity data, and/or cleanup levels that would affect the protectiveness of the remedy. Some of the cleanup goals were based on regulations. Any changes in the regulations that would affect these cleanup goals are reviewed in Attachment 7. The cleanup goals for 1,2,4-TMB and 1,3,5-TMB were based on the site-specific risk assessment, as no regulations were in place at the time of the ROD.

Table A.8-9 presents the risk-based cleanup goals for 1,2,4-TMB and 1,3,5-TMB that were established in the 1996 ROD, the clarification to those cleanup goals presented in the 2002 ESD, as well as the current USEPA risk based screening levels available at the time this report was drafted (USEPA 2016). Table A.8-9 also presents the toxicity criteria used to develop these risk-based cleanup goals. Inhalation toxicity criteria for non-cancer health effects that pre-date the USEPA's Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment) (USEPA 2009a) are in the form of a inhalation reference dose (RfDi, mg/kg-day), while the newer inhalation toxicity criteria for non-cancer health effects are in the form of an inhalation reference concentration (RfCi, mg/m^3). In order to make a direct comparison among older and new inhalation toxicity criteria, the older RfDi were converted to RfCi by using a standard adult body weight (70 kg) and daily inhalation rate of 20 m^3/day in Table A.8-9.

As seen in Table A.8-9, the provisional RfCi's for both TMBs have slightly increased over time, indicating that the TMBs appear to be slightly less toxic now than when they were first evaluated in the 1994 Risk Assessment. Therefore, although the toxicity criteria have changed over time, this change in toxicity criteria alone does not affect protectiveness of the remedy. The current provisional inhalation reference concentration is a provisional peer-reviewed toxicity value (PPRTV)[2] for 1,2,4-TMB, which was developed in 2007. The final IRIS assessment includes a new oral toxicity criteria for 1,2,4-TMB.

For 1,3,5-TMB, no chronic pRfCi PPRTV could be derived, due to the lack of suitable peer-reviewed toxicity criteria. However, a subchronic pRfCi is presented in the PPRTV documentation. This subchronic pRfCi includes a composite uncertainty factor of 3,000. A subchronic RfCi may typically be extrapolated to a chronic RfCi, which would be appropriate to

[2] The USEPA's standard database for toxicity criteria, the Integrated Risk Information System (IRIS, USEPA 2015d) has not included toxicity criteria for TMBs. When toxicity criteria in IRIS is lacking, USEPA's Superfund Program will use provisional peer-reviewed toxicity values (PPRTV) which have been developed by USEPA but not yet undergone the multi-program consensus review provided for IRIS toxicity criteria.

use in a CERCLA risk assessment, by applying an additional uncertainty factor of 10. This would increase the total composite uncertainty factor to 30,000, which is greater than the limit of 10,000 that the USEPA generally considers to be appropriate in developing reference values. Therefore, no chronic RfCi is presented in the PPRTV. For oral exposures, screening level toxicity criteria for non-cancer health endpoints (an oral reference dose) are provided in an appendix to the PPRTV documentation. These screening level toxicity criteria are generally not suitable for use in quantifying risk, although the USEPA RSLs incorporate these appendix screening PPRTV values. Due to the uncertainty inherent in these PPRTV screening toxicity values, the U.S. Army's position is that they are unusable in quantitative risk assessment, as they do not fit into the hierarchy for toxicity values specified in DoD Instruction 4715.18 titled Emerging Contaminants (DOD 2009). Furthermore, the USEPA is in the process of developing new toxicity criteria for 1,3,5-TMB in its Integrated Risk Information System (IRIS). As part of their review of the toxicity for 1,3,5-TMB, it commissioned a peer-review of the oral toxicity studies that were utilized in the Appendix to the PPRTV. That review rejected used of the oral toxicity studies as being inadequate (USEPA 2013). Therefore, the screening level pRfDo presented in the PPRTV (Table A.8-9) should not be used for quantifying risk or developing a risk-based concentration at FWA. The final IRIS assessment includes a new oral toxicity criteria for 1,3,5-TMB.

Since the cleanup goals for 1,2,4-TMB and 1,3,5-TMB were developed as risk-based concentrations, the exposure assessment used as a basis of the risk assessment performed as part of the 1994 Remedial Investigation was also reviewed. In the 1994 Risk Assessment Report, it is explained that an assumed future resident would be exposed to contaminated groundwater at the site (while using groundwater as a drinking water source, i.e., tapwater) via three different exposure pathways: ingestion, dermal, and inhalation of volatiles during showering or washing dishes with tapwater (E&E 1994). The risk-based concentrations that were identified in the 1996 OU 3 ROD for 1,2,4-TMB and 1,3,5-TMB (14 and 12 parts per billion or µg/L, respectively) were described as assuming *"residential groundwater ingestion, inhalation, and dermal contact, and is based on a hazard quotient of 1."*

These risk-based concentrations were reviewed and revised as part of the 2002 ESD, which provided a clarification for the risk-based cleanup goals identified for these two TMBs. The ESD stated, *"The remedial goals for 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene are based on a risk-based concentration (RBC) equivalent to a noncancer hazard quotient of 1 using a residential groundwater exposure assumption. The values established in the ROD were erroneously selected from the wrong column in the Region 3, RBC tables. The values listed in the ROD for 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene, 0.014 mg/l and 0.012 mg/l, respectively, correspond to an inhalation pathway. The residential groundwater assumptions in the RI/FS correspond to a remedial goal of 1.85 mg/l for both compounds."*

While the statement in the 2002 ESD is true that the lower risk-based concentrations identified in the quote above do correspond to levels protective of inhalation exposures to residential tapwater use, from a risk technical perspective, this five-year review believes that elimination of the inhalation pathway in the ESD was an error. This is because the 1994 baseline risk assessment clearly considered residential inhalation of volatiles from tapwater to be a complete exposure pathway which was quantified in characterizing the baseline risk from exposure to site contaminants. Therefore, the change in risk-based cleanup goals for the TMBs in the ESD was not justified. If these changes were based upon risk management considerations, none were described in available documentation.

The cleanup goals for 1,2,4-TMB and 1,3,5-TMB should be reviewed. This re-evaluation may identify risk-based concentrations as the cleanup goals. Since the USEPA was revising its IRIS toxicity assessment for TMBs at the time this report was being drafted (USEPA 2015e), the re-evaluation of a risk-based concentration would benefit from waiting until the IRIS assessments are complete. Alternatively, this re-evaluation may consider adopting the groundwater cleanup goals for 1,2,4-TMB and 1,3,5-TMB identified in the Alaska regulations 18 AAC 75. They are identical to the groundwater cleanup goals identified in the 2002 ESD.

Note that as this report was being finalized, the IRIS assessments for these two compounds were released as final (USEPA 2016b). The finalized IRIS toxicity criteria are also presented in Table A.8-9. These are the toxicity criteria that should be used in developing new risk-based concentrations, unless a decision is made to adopt the ARAR based values as cleanup goals. The values of these final IRIS toxicity criteria do not change the interpretation of the risk-based cleanup goals provided above, and they support the recommendation to re-evaluate risk-based cleanup goal development for these compounds.

Vapor Intrusion Review

As for OU-1 and OU-2, the potential for vapor intrusion was evaluated at OU-3 using the latest USEPA and ADEC guidance on vapor intrusion. The only potential areas of the site that could have a potential vapor intrusion issue are those areas in which a currently occupied building exists, and in the case of OU-3, this is the area adjacent to Remedial Area 1B, just off the site. The results of sampling the off-site wells (FES 2015a) were reviewed and compared to USEPA and ADEC VISL. Only those wells screened in the alluvial aquifer in this region of the site would have the potential to pose vapor intrusion concerns; wells screened in the bedrock aquifer were assumed to not pose vapor intrusion risks, as any vapors emanating from this deeper zone would be attenuated by the presence of groundwater and/or permafrost in the subsurface above this area before reaching potential residential receptors. However, to be conservative, the sampling results from these bedrock well results were also screened against VISL. Table A.8-10 presents this evaluation. No off-site groundwater sampling results exceed any VISL and vapor intrusion is not a concern at OU-3.

Ecological

An ecological risk assessment was performed for OU-3 at the time of the 1996 ROD and concluded that lead concentrations in surface soil around the tank farm could pose a potential risk to wildlife. This will be mitigated by removal of lead contaminated soil, which is addressed in the OU-5 discussion.

Significant Finding

Not all of the exposure assumptions, toxicity data, cleanup levels, and RAOs established at the time of the remedy remain valid. The major exposure assumptions for current and future potential land use have not changed. In addition, although potential vapor intrusion risks to off-site residents were not evaluated at the time of the remedy, groundwater concentrations in that area of OU-3 remain below very conservative vapor intrusion levels and vapor intrusion is not a concern. The toxicity criteria used to develop risk-based concentrations for 1,2,4-TMB and

1,3,5-TMB have been updated since the cleanup goals were identified in the 1996 ROD and changed in the 2002 ESD. These toxicity changes do not indicate that the TMBs are more toxic now than previously assumed, so the toxicity changes do not affect the protectiveness of the remedy. However, from a technical perspective, the five-year review believes that elimination of the inhalation pathway from the development of TMB cleanup goals in the ESD was an error. This is because the 1994 baseline risk assessment clearly considered residential inhalation of volatiles from tapwater to be a complete exposure pathway, which was quantified in characterizing the baseline risk from exposure to site contaminants. Therefore, the change in TMB risk-based cleanup goals in the ESD was not justified; they should not have been increased by over a factor of 100. As land use controls are in place to prevent ingestion of groundwater, the remedy remains protective in the short term. If the groundwater would be used as a source of residential tapwater, the cleanup goals may not be fully protective. In order for the remedy to remain protective in the long-term, the cleanup goals for 1,2,4- TMB and 1,3,5- TMB should be re-evaluated. This re-evaluation may identify a risk-based concentration as the cleanup goal and should consider all relevant complete exposure pathways to residential exposure to tapwater, including ingestion, inhalation, and dermal exposure. Since the USEPA recently released as final an IRIS toxicity assessment for TMBs, the re-evaluation of a risk-based concentration should incorporate the final IRIS toxicity criteria for these compounds. Alternatively, this re-evaluation may include a consideration of the adoption of groundwater cleanup goals for 1,2,4-TMB and 1,3,5- TMB identified in 18 AAC 75. These groundwater standards are identical to the cleanup goals identified in the 2002 ESD.

OU-4

Human Health

The OU-4 ROD was signed in 1996 to address contamination at three source areas: the Landfill, the Coal Storage Yard, and the Fire Training Pits. Soil contamination at the Fire Training Pits was addressed via a removal action. The ROD established the following RAOs for the residual groundwater contamination remaining at the Landfill and Coal Storage Yard.

- Restore groundwater to drinking water quality.
- Prevent further leaching of contaminants into groundwater.
- Reduce or prevent further migration of contaminated groundwater.
- Prevent use of groundwater containing contaminants above Safe Drinking Water Act and State Water Quality Act Standards.

Most of the groundwater cleanup goals established in the 1996 ROD were based on Safe Drinking Water Act and State Water Quality Act Standards and are reviewed in Attachment 7. One compound, 1,1,2,2-tetrachloroethane, lacked Safe Drinking Water Act or State Water Quality Act standards and its cleanup goal was developed from the baseline risk assessment. Since this compound is considered a carcinogen, the risk-based cleanup goal was developed using an incremental lifetime cancer risk (ILCR) target of 1 in 10,000 (1×10^{-4}), which is the upper end of the range of what USEPA considers to be an acceptable cancer risk. The USEPA's current risk-based screening levels (RSLs) are developed using an ILCR of 1 in 1,000,000 (1×10^{-6}), which is the lower end of the acceptable cancer risk range. As presented in Table A.8-11a, the current USEPA RSL is 7.6×10^{-2} μg/L for an ILCR of 1×10^{-6}, which is equivalent to a risk-based concentration of 7.6 μg/L if the target ILCR were to be raised to 1×10^{-4}. The change in the RSL is mainly due to the updated toxicity criteria that was revised in IRIS in 2010 (Table

A.8-11b). However, as the updated toxicity criteria results in a higher risk-based target concentration, this change in toxicity does not affect the protectiveness of the remedy as it was identified in the ROD.

Land use at the Landfill and Coal Storage Yard is light industrial and access is restricted by fencing and signs. The fence surrounding both of these areas was intact and in good condition.

The Coal Storage Yard was recommended for no further action in the Second Five Year Review, with the stipulation that institutional controls needed to remain in place to prevent excavation or groundwater intrusion. The institutional controls appear to be in place, therefore, the exposure assumptions established at the time of the ROD appear to be still valid.

Groundwater monitoring is on-going at the Landfill. Since institutional controls prevent the use of groundwater in the vicinity of the landfill for drinking water purposes and there are no currently occupied buildings in the vicinity of the landfill that would warrant an evaluation for vapor intrusion concerns, the exposure assumptions established at the time of the ROD appear to still be valid.

Ecological

Because the Coal Storage Yard and Landfill are industrial use properties, little undisturbed high-quality ecological habitat exists on these sites. Therefore, complete ecological exposure pathways that would warrant evaluation of ecological risk are lacking.

Significant Finding

The RAOs, cleanup levels, and exposure assumptions used at the time of the remedy selection remain valid. The change in toxicity criteria for 1,1,2,2-tetrachloroethane that occurred in 2010 does not affect the protectiveness of the remedy. Although the vapor intrusion pathway was not explicitly evaluated at this OU at the time of the ROD, there are no currently occupied buildings in the vicinity of the landfill (or in the previously remediated areas of the coal storage yard) that would warrant an evaluation for vapor intrusion concerns, the exposure assumptions established at the time of the ROD appear to be still valid.

OU-5

Human Health

The OU-5 ROD was signed in 1999 that addressed soil and groundwater contamination at the West Quartermasters Fueling System (WQFS), the East Quartermasters Fueling System (EQFS), and lead contamination in soil at Remedial Area 1A at the BHTF. In addition, RAOs for protecting the nearby Chena River from contamination leaching from the WQFS were included in the ROD.

Soil Contamination

RAO’s for soil source areas:

- Prevent the migration to groundwater of soil contaminants that could result in groundwater contamination and exceedances of federal MCLs and nonzero maximum contaminant level goals (MCLGs) and to groundwater that is closely hydrogeologically connected to surface water (such as the Chena River) that could result in exceedances of Alaska Water Quality Standards (AWQS) in surface water.

- Limit human health and terrestrial receptor exposure to lead-contaminated soil (Remedial Area 1A).

The first RAO was addressed by a soil removal action (1998) and operation of an AS/SVE system that was in place. Evaluation of the residual source term conducted in 2009 indicated that there may be a source remaining in soil that would continue to impact groundwater. The uncertainty surrounding the residual soil source term is unlikely to affect protection of human health, as there is very little direct soil contact since the area is only used for recreational use, and there is no ingestion of groundwater or intrusion of groundwater vapors into buildings as no occupied buildings exist in the area. However, the residual soil source term may be impacting ecological receptors if the soil source term continues to impact groundwater which discharges to the Chena River. This is evaluated below under ecological exposures.

The second RAO for projection of human health will be met when lead contaminated surface soil is removed from Remedial Area 1A (Marsh Creek and Weston 2015). The current plan is to remove all soils in excess of 400 mg/kg lead, which is the target level to protect human health in a residential setting (USEPA 2015c). This will result in a removal of an estimated 2,000 tons of contaminated soil. The remedial action identified in the 1999 OU 5 ROD to address lead contaminated soil in Remedial Area 1A referred to a To-Be-Considered criterion of the USEPA's Region 9 Industrial Preliminary Remediation Goal. This industrial risk-based concentration was 1,000 mg/kg lead at the time of the ROD. The USEPA's current industrial risk-based concentration for soil lead is 800 mg/kg (USEPA 2015c). The lowering of the risk-based concentration for lead in soil to protect industrial exposure does not affect the protectiveness of the remedy, since the decision was made to excavate all lead contaminated soil above 400 mg/kg, which is protective of residential use.

Exposure to Groundwater Contamination

The groundwater RAOs established in 1999 ROD included:

- Restore groundwater to its beneficial uses within a reasonable time frame.
- Reduce or prevent further migration of contaminated groundwater from the source areas to the downgradient aquifer or surface water bodies that are closely hydrologically connected by achieving MCLs (where there are no nonzero MCLGs) and AWQS. For groundwater that is hydrologically connected to surface water, AWQS will apply for the following Fresh Water Uses: (l)(A) Water Supply; (l)(B) Water Recreation; and (l)(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife.
- Ensure there is no risk to aquatic receptors through control of contaminant movement through the groundwater into the Chena River.
- Remove floating product to the extent practicable to eliminate film or sheen from groundwater.
- Prevent use of groundwater containing contaminants at levels above Safe Drinking Water Act MCLs, non-zero MCLGs, or the following AWQS for Fresh Water Uses: (l)(A) Water Supply; (l)(B) Water Recreation; and (l)(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife.

Most of the groundwater cleanup goals established in the 1999 ROD were based on Safe Drinking Water Act and State Water Quality Act Standards that are reviewed in Attachment 7. One compound, bis(2-chloroethyl)ether, lacked these standards and its cleanup goal was developed from the baseline risk assessment. Since this compound is considered a carcinogen, the risk-based cleanup goal was developed using an ILCR target of 1 in 1,000,000 (1×10^{-6}). As presented in Table A.8-12, the current USEPA RSL is 1.4×10^{-2} µg/L (also for an ILCR of 1×10^{-6}), slightly greater than the ROD risk-based cleanup goal of 9.2×10^{-3} µg/L. The slight change in the RSL is due to updated risk assessment methodology, as the IRIS cancer toxicity criteria for this compound has not been reviewed or revised since 1987. The updated risk assessment methods include guidance for characterizing risk for both the dermal and inhalation exposure pathways (USEPA 2004 and 2009a), as well as updates to recommended default exposure parameters (USEPA 2014a). Because the current USEPA RSL is greater than the original ROD risk-based target concentration, these risk assessment methodology updates do not affect the protectiveness of the remedy for this compound as identified in the ROD.

Ecological

Exposure to Surface Soil Contamination

Lead-contaminated surface soil in Remedial Area 1A (Birch Hill Tank Farm) was identified as the primary contributor to potential ecological risk for a red fox. The ROD indicates that existing fencing at Remedial Area 1A would help to mitigate these risks to terrestrial communities, presumably by limiting exposure. In addition, the areas of surface soil contamination do not provide a high quality suitable habitat for the red fox. However, as indicated above, remedial action is currently being planned to remove the surface soil lead contamination from Remedial Area 1A (Marsh Creek and Weston 2015). All soils containing lead greater than 400 mg/kg (the target level to protect human health in a residential setting) will be removed. This will result in the removal of approximately 2,000 tons of contaminated soil. Although a site-specific ecological cleanup goal was not developed for the site [which may be lower than 400 mg/kg (USEPA 2005)], removal of this much lead contaminated soil will also assist in mitigating potential ecological risks from exposure to contaminated soil at the site.

Exposure to Sediment and Surface Water Contamination in the Chena River

The 1999 ROD specified the following RAOs for Chena River Sediment and Surface Water:

- Reduce sources of contaminant releases to the Chena River.
- Meet the following AWQS for Fresh Water Uses: (1)(A) Water Supply; (1)(B) Water Recreation: and (1)(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife.
- Continue aquatic assessment.

The third RAO was determined to have been met in 2005. The potential for ecological risks to aquatic life in the Chena River were assessed as part of a Chena River Aquatic Assessment Program (CRAAP). This program was initiated in 1997 and continued in 2002. A 2002 Sediment Monitoring Report measured only very low concentrations of polycyclic aromatic hydrocarbons (PAHs) in Chena River sediments (and pore water) adjacent/downgradient of seep areas (CH2M HILL 2002). With two exceptions, the toxicity to test organisms (measured in terms of survival, growth, and reproduction) exposed to seep area sediments was comparable to toxicity to test organisms exposed to reference area sediments. The lack of gross contamination in the river sediments adjacent to seep areas may be explained by this observation in the report, *"Sediments in the Chena River are subject to significant scouring during high water events and during typical ice break-up events in the spring."* In the second Five Year Review report, it was stated that the CRAAP *"found evidence that contamination from the Fort Wainwright source areas was potentially adversely influencing biotic health in the Chena River ecosystem but did not prove that sediment toxicities caused changes in the benthic invertebrate communities of the Chena River"* (AEC 2006). In 2005 it was determined by the RPMs to be no longer necessary and was discontinued. However, groundwater discharges to the river have continued to be monitored.

Groundwater sampling of monitoring wells adjacent to the River

Groundwater monitoring wells along the Chena River were sampled in 2012, 2013, and 2014. Each year, results were well below ADEC surface water quality criteria for total aromatic hydrocarbons (TAH) and total aqueous hydrocarbons (TAqH). However, in 2014, levels of benzene and diesel range organics (DRO) in one of the wells along the Chena River (AP-10220MW) showed an increasing trend relative to previous years. Although these contaminant increases may be the result of the high groundwater level in 2014 (due to unusually high rain fall that year), there is also residual soil contamination in this area. The contaminant trends in this well should be closely monitored in the future to ensure continued protection of the Chena River.

Sediment sampling of the River

The 2012 OU 5 Monitoring Report included results of additional sampling of DRO-contaminated sediment from the river bank. The PAH levels measured in 2012 were within the range of PAHs detected during the CRAAP. The 2012 monitoring report thus concluded:

> *"The CRAAP used a comprehensive weight-of-evidence approach that included evaluating bulk sediment chemistry, bulk detritus chemistry, benthic macroinvertebrate community analysis, Chironomus tentans bioassays, and Chironomidae community analysis. The results were somewhat ambiguous with respect to contaminant impacts on the biotic integrity of the Chena River, but did not suggest adverse impacts on ecosystem structure and function (ABR, Inc., and CH2M HILL, 1999). As a result, the PAH detections in sediment identified during the 2012 sampling event do not appear to represent increased ecological risk at the site."*

Discrete surface water sampling of the River

Surface water samples in the River were obtained in 2012 as grab samples adjacent to well points installed in 2012 along the shore of the Chena River. The samples contained only trace levels of contaminants (DRO, benzene, toluene, ethylbenzene, xylenes, and naphthalene) at levels below ADEC surface water criteria. In addition, pore water samples were obtained from the well points, which showed some exceedances of surface water quality criteria (TAH and TAqH in well WP7). The elevated pore water contaminant concentrations were all located from samples obtained within the boom area.

Passive surface water sampling of the River

In 2012, GORETM module sampling was conducted which *"supported the conclusion that there is not significant contaminant migration into the Chena River occurring, either from the sediments directly adjacent to the river, or from contaminated groundwater migrating into the river."* The passive sampling was repeated in 2013, although the sampling methods were not the same so a direct comparison of results could not be made. The passive sampling was only used for screening purposes in 2013.

Chena River sheen observations and boom installation

In 2012, improvements in the visual observations for boom effectiveness were made to include greater detail so that effects from the Sparge Curtain treatment system shut down could be assessed. These included development of sheen observation stations at 10-feet intervals and recording of river stage heights at various points on the River. Sheen observations in the River continued in 2013, 2014, and 2015 and no increases in sheen occurrences (relative to 2012) were observed in more recent years. However, in 2015, the sheen was not observed until after walking along the shore, indicating that the sheen was released due to disturbance of shoreline sediments. In fact, in 2015, sheen was only observed during a single inspection, which represents the fewest number of sheen detections since the detailed observations were initiated in 2012. Sheen was not observed in any of the groundwater wells along the Chena River in 2013 or 2014 either. In the 2013 monitoring report, it was noted that the presence of sheen was correlated with shoreline width, which was inversely correlated with river stage. Sheen is likely produced when the river elevation is low, which allows the residual contamination in the sediments to seep into the river with groundwater discharge.

The draft 2014 OU-5 Monitoring Report indicates the harbor and absorbent boom system was deployed in 2014 and 2015 (May through October) to contain any potential sheen in the Chena River. Sheen was observed at one observation period in May 2014. In June 2014 the water level in the river rose so high that the boom floated off its supports and up against the river bank. This was due to unusually high rainfall that occurred in the summer of 2014. As noted in the monitoring report, the presence of sheen in the river is correlated with a lower River stage and it is likely that the high river stage in 2014 served to counter the migration of sediment and also groundwater contamination from discharging into the river. No other sheen observations were made that summer and the boom was removed in October 2014.

Significant Findings

The exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy selection for protection of human health are still valid. Although the risk-based concentration for industrial exposure to lead in soil (identified as a to-be-considered criterion in the ROD) is now lower than it was at the time of the remedy, this does not affect protectiveness of the remedy at Remedial Area 1A, since the current target for excavation of lead contaminated soil is the USEPA’s risk-based concentration for protection of residential exposure. In addition, there is one groundwater COC [bis(2-chloroethyl)ether] for which a risk-based concentration was established as the groundwater cleanup goal in the ROD. The toxicity criteria for this compound has not changed, although the USEPA’s current risk-based concentration for this compound is slightly greater due to changes in risk assessment methods.

For protection of the environment (Chena River), the weight of evidence from the various sampling events performed in the past five years indicates that the cleanup goals and RAOs are still valid. The lines of evidence include collection of additional sediment and surface water samples from the Chena River (both discrete and passive surface water sampling), pore water samples from wells placed at the river shore, groundwater samples from monitoring wells adjacent to the river, sheen observations along the river, observations of river stage and shoreline width, and installation of a boom in the river. In 2014, levels of benzene and DRO in one monitoring well (AP-10220MW) along the river showed an increasing trend relative to previous years, although surface water quality criteria have not been exceeded in this well. The contaminant increases may be the result of the high groundwater level in 2014 (due to unusually high rain fall that year), which caused desorption of contaminants on vadose zone soils. Lower concentrations of benzene, DRO, and GRO were measured in this well (AP-10220MW) in 2015. Since the Sparge Curtain treatment system was approved for decommissioning in 2013, the contaminant trends in this well should be closely monitored to ensure continued protection of the Chena River.

OU-6

Human Health

The ROD was signed in 2014; OU-6 is only being reviewed at this time in order to keep all the CERCLA operable units on the same Five Year Review schedule.

Table 1 of the 2014 ROD lists soil and groundwater cleanup goals for OU-6. Most of these cleanup goals are ARAR based and are reviewed in Attachment 7. Table A.8-13 reviews those cleanup goals that were based on risk to determine whether changes in toxicity criteria or exposure assumptions may have occurred since the cleanup goals were established. For aluminum and manganese, no changes have occurred which would affect the risk-based cleanup goals for soil in OU-6. These cleanup goals are based on protection of residential exposure, using USEPA default exposure assumptions. Those exposure assumptions are protective of someone living in the continental United States, and assume more exposure than would occur in Alaska, where snow cover and frozen ground would limit the amount of soil someone may be exposed to over the course of a year.

Since the signing of the ROD, occupancy of the housing unit at OU-6 is now allowed. Since VOCs (including TCE) are COCs in groundwater in OU-6, the housing units are being monitored for potential vapor intrusion impacts on a quarterly basis for a period of 5 years. This is currently being accomplished by sampling and analyzing the sub-slab below 12 representative housing units for VOCs, and applying a site-specific attenuation factor to estimate the amount of VOCs in indoor air from sub-slab sources. The site-specific attenuation factor was developed using paired sub-slab and indoor air samples analyzed for radon, first during the 2010 RI and then during the initiation of the 5 year quarterly sampling effort in spring of 2014. The use of radon as a surrogate for developing site-specific attenuation factors for vapor intrusion is discussed in USEPA 2015a. This site-specific attenuation factor is used to develop site-specific VISL, which are derived from the ADEC VISL for indoor air. As discussed on the first page of this attachment, the USEPA has also developed VISL, which use the USEPA RSL (for indoor air) as their basis. Since the USEPA has updated their VISL calculator in January 2016 using the most recent toxicity criteria available, the USEPA VISL for indoor air were compared to the ADEC indoor air VISL to ensure that the ADEC indoor air VISL remain protective. As explained in ADEC 2012, the ADEC indoor air VISL are based on a cancer risk of 1E-05 and a hazard quotient of 1. Therefore, USEPA VISL were set to the same risk limits. The comparison of ADEC 2012 VISL and current USEPA VISL for indoor air are presented in Table A.8-14. (ADEC uses an attenuation factor of 0.1 for sub-slab samples, while the USEPA VISL calculator uses an attenuation factor of 0.03. Therefore, the indoor air VISL are used for a direct comparison.) As seen in Table A.8-14, the current USEPA VISL for indoor air are all comparable to the ADEC 2012 VISL for indoor air. The single exception is the absence of an ADEC VISL for hexachlorobutadiene, a compound which was not detected in 2014 or 2015 in

OU-6 sub-slab samples. Therefore, the ADEC and project-specific and site-specific VISL for OU-6 remain protective.

In addition to using the site-specific VISL, the sub-slab sampling results are first being compared to Alaska "generic" VISL for sub-slab samples developed by ADEC (ADEC 2012), which are much more conservative than the site-specific VISL. There have only been sporadic low level exceedances of the Alaska sub-slab VISL in OU-6 sub-slab samples, and no exceedances of the site-specific screening levels. Therefore, this VI monitoring indicates that the remedy remains protective of residents inhabiting the housing unit at OU-6.

Ecological

As OU-6 is a residential housing development, little high quality ecological habitat exists at this operable unit. The conclusions from the phased ecological risk assessment that no constituents of potential ecological concern or areas that would require additional sampling to protect ecological resources at the site exist in OU-6 remains valid.

Significant Finding

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection at OU-6 remain valid. The site is now being used for residential use, and that potential exposure was assessed during the RI and identified as an anticipated land use at the time of the ROD. No changes to toxicity criteria for risk-based cleanup goals identified in the ROD for soil and groundwater, or vapor intrusion screening levels used in the VI monitoring reports have occurred. The remedy remains protective of human health and the environment.

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Table A.8-1 Summary of Toxicity Criteria Changes for Ft. Wainwright Human Health Constituents of Concern

Constituent of Concern	Operable Units	Media	Cleanup Goal Basis	Date of RODs	Toxicity Criteria Last Reviewed in IRIS	Current Toxicity Criteria Source	Change in Toxicity Criteria since ROD?
Aluminum	6	Soil	Risk	2014	NA	PPRTV (2006)	No change in toxicity criteria
Copper	6	Soil	ARAR	2014	1988	HEAST (1987)	No change in toxicity criteria
Manganese	6	Soil	Risk	2014	1993 (inhalation reference concentration), 1995 (oral reference dose)	IRIS	No change in toxicity criteria
Aldrin	1	Soil, Groundwater	Risk	1997	1987	IRIS	No change in toxicity criteria
Dieldrin	1	Soil, Groundwater	Risk	1997	1988	IRIS	No change in toxicity criteria
Benzene	1, 2, 3, 4, 5	Groundwater	ARAR	1996, 1997, 1999	2003 (non-cancer), 2000 (cancer)	IRIS	Yes, change in toxicity criteria will be reviewed vs. ARAR-based cleanup goal
Toluene	2, 3, 4, 5,	Groundwater	ARAR	1996, 1997, 1999	2005	IRIS	Yes, change in toxicity criteria will be reviewed vs. ARAR-based cleanup goal
Ethylbenzene	2, 3, 4, 5,	Groundwater	ARAR	1996, 1997, 1999	1987 (inhalation reference concentration), 1991 (oral reference dose), 1988 (cancer)	CalEPA (cancer), IRIS (non-cancer)	No change in toxicity criteria
Xylene	2, 4, 5	Groundwater	ARAR	1996, 1997, 1999	2003	IRIS	Yes, change in toxicity criteria will be reviewed vs. ARAR-based cleanup goal
1,1-Dichloroethene	1, 2	Groundwater	ARAR	1997	2002	IRIS	Yes, change in toxicity criteria will be reviewed vs. ARAR-based cleanup goal
Tetrachloroethene	2	Groundwater	ARAR	1997	2012	IRIS	Yes, change in toxicity criteria will be reviewed vs. ARAR-based cleanup goal
Trichloroethene	2, 4, 5, 6,	Groundwater	ARAR	1996, 1997, 1999, 2014	2011	IRIS	Yes, change in toxicity criteria will be reviewed vs. ARAR-based cleanup goal
cis-1,2-Dichloroethene	1, 2, 4	Groundwater	ARAR	1996, 1997	2010	IRIS	Yes, change in toxicity criteria will be reviewed vs. ARAR-based cleanup goal
Vinyl chloride	1, 2, 4	Groundwater	ARAR	1996, 1997	2000	IRIS	Yes, change in toxicity criteria will be reviewed vs. ARAR-based cleanup goal
1,2-Dibromoethane	3, 5	Groundwater	ARAR	1996, 1999	2004	IRIS	Yes, change in toxicity criteria will be reviewed vs. ARAR-based cleanup goal
1,1,2,2-Tetrachloroethane	4	Groundwater	Risk	1996	2010	IRIS (oral cancer slope factor and oral reference dose), CalEPA (inhalation unit risk)	Yes, change in toxicity criteria indicates less toxic compound
1,1,2-Trichloroethane	4	Groundwater	ARAR	1996	1988 (non-cancer), 1987(cancer)	IRIS	No change in toxicity criteria
1,2-Dichloroethane	3, 5	Groundwater	ARAR	1996, 1999	1987	IRIS (cancer), PPRTV (non-cancer)	No change in toxicity criteria
1,2,4-Trimethylbenzene	3	Groundwater	Risk	1996, 2002 (ESD)	2016 (9 September)	IRIS	Yes, change in toxicity. Recommendation to review the risk-based cleanup goal
1,3,5-Trimethylbenzene	3	Groundwater	Risk	1996, 2002 (ESD)	2016 (9 September)	IRIS	Yes, change in toxicity. Recommendation to review the risk-based cleanup goal
1,2,3-Trichloropropane	6	Soil, Groundwater	ARAR	2014	2009	IRIS	No change in toxicity criteria
Bis(2-chlorethyl)ether	5	Groundwater	Risk	1999	1991 (non-cancer), 1987 (cancer)	IRIS	No change in toxicity criteria
bis(2-Ethylhexyl) phthalate	4, 5	Groundwater	ARAR	1996, 1999	1987 (non-cancer), 1988 (cancer)	IRIS (oral cancer slope factor and oral reference dose), CalEPA (inhalation unit risk)	No change in toxicity criteria

IRIS is the USEPA Integrated Risk Information System, the primary source of toxicity criteria for CERCLA risk assessments.
PPRTV are the USEPA's provisional peer reviewed toxicity criteria, the secondary source of toxicity criteria for CERCLA, when IRIS toxicity criteria are absent.
CalEPA is the California Environmental Protection Agency, a tertiary source of toxicity criteria for CERCLA, when IRIS toxicity criteria are absent.
HEAST is the USEPA's health effects summary assessment table, a tertiary source of toxicity criteria for CERCLA, when IRIS toxicity criteria are absent.
The hierarchy of toxicity sources for CERCLA risk assessments was established in 2003 in the USESPA OSWER directive, 9285.7-53

Table A.8-2 Toxicity Criteria Updates Impact on Risk-Based Cleanup Goal vs. Current ARAR-based Cleanup Goal (MCL) for Groundwater

COC with toxicity criteria change	Current EPA Risk Based Concentration at ILCR of 1E-06 (ug/L)	Current EPA Risk Based Concentration at HI of 1 (ug/L)	ARAR based cleanup goal (ug/L)	Level of protection afforded by current MCL (ARAR based cleanup goal)
Benzene	0.46	33	5	MCL still protective at ILCR ~ 1E-05 and HI of <1
Toluene	NA	1,100	1,000	MCL still protective at HI of <1
1,2-Dibromoethane	0.0075	17	0.05	MCL still protective at ILCR < 1E-05 and HI of <1
Tetrachloroethene	11	41	5	MCL still protective at ILCR < 1E-06 and HI of <1
Trichloroethene	0.49	2.8	5	MCL still protective at ILCR ~ 1E-05 and HI of ~ 1 within range of uncertainties
1,1-Dichloroethene	NA	280	7	MCL still protective at HI of <1
cis-1,2-Dichloroethene	NA	36	70	MCL still protective at HI of ~ 1 within range of uncertainties
Vinyl chloride	0.019	44	2	MCL still protective at ILCR < 1E-04 and HI of <1

Current EPA Risk Based Concentration was obtained from the May 2016 version of the EPA Regional Risk Based Screening Level Table, Tapwater values

MCL is EPA's Maximum Contaminant Level for drinking water.

ILCR is incremental lifetime cancer risk. The EPA's acceptable range of cancer risks are 1E-06 up to 1E-04.

HI is hazard index (non-cancer health effects). A hazard index of 1 or below indicates that adverse non-cancer health effects are unlikely to occur.

NA indicates screening level not available for that target risk or hazard; not toxic via that endpoint.

Table A.8-3 Comparison of Toxicity Criteria for Trichloroethene and cis-1,2-Dichloroethene

	SF_O $(mg/kg\text{-}day)^{-1}$	Source of SFo	Inhalation Cancer Risk Factor (IUR or CSFi)	Units	Source of Inhalation Cancer Risk Factor	RfD_o (mg/kg-day)	Source of RfDo	Inhalation Reference Dose or Reference Concentration	Units	Source of Inhalation Reference Dose
trichloroethene										
2016 Toxicity Criteria	4.60E-02	IRIS	4.1E-06 (IUR)	$(ug/m^3)^{-1}$	IRIS	5.00E-04	IRIS	0.002 (RfCi)	mg/m^3	IRIS
Previous Toxicity Criteria (OU-1 1996)	1.10E-02	NCEA provisional value 1993	6.0E-03 (CSFi)	$(mg/kg\text{-}day)^{-1}$	NCEA provisional value 1993	6.00E-03	NCEA provisional value 1993	NA		
cis-1,2-dichloroethene										
2016 Toxicity Criteria	NA		NA			2.00E-03	IRIS	NA		
Previous Toxicity Criteria (OU-1 1996)	NA		NA			1.00E-02	HEAST 1995	NA		

The source of the previous toxicity criteria is Table 6.1-11 from the OU-1 Remedial Investigation Report, 1996.
SF_O is oral cancer slope factor
RfDo is oral reference dose (non-cancer)
IRIS is the EPA's Integrated Risk Information System
NCEA is the EPA's National Center for Exposure Assessment, Cincinnati, Ohio
HEAST is the Health Effects Assessment Summary Table
NA not available/ not provided

Table A.8-4 Comparison of Vapor Intrusion Screening Levels and Cleanup Goals for Groundwater COCs at Ft. Wainwright

Constituent of Concern	Units	ROD Cleanup Goal Concentration (MCL)	USEPA 2016 Residential VISL at 5°C (ICLR 1E-04 and HQ of 1)	ADEC Residential VISL (2012)
benzene	µg/L	5	370	14
toluene	µg/L	1,000	59,000	19,200
ethylbenzene	µg/L	700	1,200	30
1,2,4-Trimethyl benzene	µg/L	1850	120	29
1,3,5- Trimethyl benzene	µg/L	1850	NIT	20
1,2-dichloroethane	µg/L	5	430	19
1,2-dibromoethane	µg/L	0.05	61	1.5
1,1-dichloroethene	µg/L	7	430	200
vinyl chloride	µg/L	2	27	1.4
tetrachloroethene	µg/L	5	190	58
trichloroethene	µg/L	5	15	5.2
cis-1,2-dichloroethene	µg/L	70	NIT	44
1,1,2,2-tetrachloroethane	µg/L	5.2	1,200	28

Notes:

1	The USEPA VISLs were developed using VISL calculator version 3.4.6, downloaded February 2016. http://www.epa.gov/vaporintrusion
2	The USEPA VISLs were developed to protect residential exposure, using a groundwater temperate of 5 degrees celsius, a target cancer risk of 1E-04, and hazard quotient of 1.
ADEC	Alaska Department of Environmental Conservation
COC	constituent of concern
HQ	hazard quotent
ICLR	incremental lifetime cancer risk
MCL	Maximum Contaminant Level
NIT	No inhalation toxicity information
ROD	Record of Decision
VISL	vapor intrusion screening level
µg/L	micrograms per liter

Table A.8-5 Summary of Risk-Based Cleanup Goals for Operable Unit 1

ROD Date Cleanup Goal Identification	Source Area	Medium	Constituent of Concern	ROD Residential ILCR Limit (unitless)	1997 ROD Cleanup Goal	Units	Date toxicity criteria last reviewed in IRIS	Current 2015 EPA generic RBC for Cancer Risk Limit (mg/kg or ug/L)	Current EPA Residential ILCR Limit (unitless)	Current EPA (ILCR) RBC adjusted for Alaska*	Current Residential USEPA Generic RBC for non-cancer health effects (child HI = 1) (mg/kg or ug/L)	Current USEPA non-cancer RBC adjusted for Alaska*
June 1997	Drum Burial Site	Soils	Aldrin	1.E-04	**3.8E+00**	mg/kg	1987	3.90E+00	1.E-04	6.8E+00	2.3E+00	**4.0E+00**
June 1997			Dieldrin	1.E-04	**4.0E+00**	mg/kg	1988	3.40E+00	1.E-04	6.0E+00	3.2E+00	**5.6E+00**
June 1997	Drum Burial Site	Groundwater	Aldrin	1.E-06	**4.0E-03**	µg/L	1987	9.20E-04	1.E-06	**1.6E-03**	6.0E-01	1.1E+00
June 1997			Dieldrin	1.E-06	**4.0E-03**	µg/L	1988	1.70E-03	1.E-06	**3.0E-03**	3.8E-01	6.7E-01

Notes:

* Original exposure assumption that soil exposure frequency for resident limited to only 200 days/year due to snow cover/frozen ground is still valid. This allowed the USEPA's generic RBC to be adjusted by a factor of 350/200.

Current RBCs in blue bold should be compared to the 1997 ROD Cleanup Goal for evaluation of protectiveness

HI	Hazard index; an indication of potential for non-cancer health effects
ILCR	Incremental Lifetime Cancer Risk
IRIS	Integrated Risk Information System
RBC	risk-based concentration
ROD	Record of Decision
mg/kg	milligrams per kilogram
µg/L	micrograms per liter

Table A.8-6 Comparison of OU 1 2015 Groundwater Monitoring Results to Vapor Intrusion Screening Levels [1]

						1	3	4	6	8	9	10	11	12	13	14	15
Sample ID						15FWOU101WG	15FWOU102WG	15FWOU103WG	15FWOU104WG	15FWOU105WG	15FWOU106WG	15FWOU107WG	15FWOU108WG	15FWOU109WG	15FWOU110WG	15FWOU111WG	15FWOU112WQ
Location ID						AP-6326	AP-6331	AP-6327	AP-1010	AP-7279	AP-7282	AP-6630	AP-7284	AP-10042MW	AP-2020	AP-6001	Trip Blank
Sample Data Group						K1504900	K1504900	K1504900	K1504900	K1504900	K1504900	K1504900	K1504900	K1504900	K1504900	K1504900	K1504900
Laboratory ID						150490001F	K150490002	150490003F	150490004F	K150490005	K150490006	K150490007	K150490008	K150490009	K150490010	K150490011	K150490012
Collection Date						5/5/2015	5/5/2015	5/6/2015	5/6/2015	5/6/2015	5/7/2015	5/7/2015	5/7/2015	5/7/2015	5/7/2015	5/7/2015	5/5/2015
Matirx						WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
Sample Type						Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary	Primary	Primary	Field Duplicate	PE Sample	Trip Blank
Analyte	Method	Units	Cleanup Level[2]	USEPA VISL 2016 5° C (ILCR 1E-04, HQ 1)	ADEC VISL, residential 2012	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result[[LOD] Qualifier	Result[[LOD] Qualifier
Gasoline Range Organics (C6-C10)	AK101	µg/L	2,200			-	-	2100 [25]	2000 [25]	-	-	-	-	-	-	-	ND [25]
Diesel Range Organics (C10-C25)	AK102	µg/L	1,500			-	-	**5400 [20] J-**	**5600 [20]**	-	-	-	-	-	-	-	-
Sulfate	E300.0	mg/L	NE			13.5 [0.2]	-	0.17 [0.04] J	0.24 [0.04] J	-	-	-	-	-	-	-	-
Iron	SW6010C	µg/L	NE			30.6 [10]	-	69500 [10]	68100 [10]	-	-	-	-	-	-	-	-
Manganese	SW6010C	µg/L	NE			22.1 [1]	-	6260 [1]	6080 [1]	-	-	-	-	-	-	-	-
4,4'-DDD	SW8081B	µg/L	3.5			ND [0.0046]	ND [0.0045]	ND [0.0046]	-	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0046]	-
4,4'-DDE	SW8081B	µg/L	2.5			ND [0.0021]	ND [0.002]	ND [0.0069]	-	ND [0.002]	ND [0.002]	0.0005 [0.002] J	ND [0.002]	ND [0.002]	ND [0.002]	0.0022 [0.0021] J	-
4,4'-DDT	SW8081B	µg/L	2.5			ND [0.024]	ND [0.0072]	ND [0.015]	-	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.0022]	ND [0.0017]	ND [0.0015]	0.0013 [0.0011] J	-
Aldrin	SW8081B	µg/L	0.05 (0.004)			ND [0.0021]	ND [0.002]	ND [0.0041]	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	0.55 [0.021]	-
alpha-BHC	SW8081B	µg/L	0.14			ND [0.0021]	ND [0.002]	ND [0.0044] J-	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.0021]	-
alpha-Chlordane	SW8081B	µg/L	2			ND [0.0021]	ND [0.002]	ND [0.021] J-	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.0021]	-
beta-BHC	SW8081B	µg/L	0.47			ND [0.0046]	ND [0.0045]	ND [0.0046] J-	-	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0046]	-
Chlordane	SW8081B	µg/L	2			ND [0.21]	ND [0.2]	ND [0.21]	-	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.21]	-
Chlorpyrifos	SW8081B	µg/L	NE			ND [0.0021]	ND [0.002]	ND [0.015]	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.0021]	-
cis-Nonachlor	SW8081B	µg/L	NE			ND [0.0021]	ND [0.002]	ND [0.0021]	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.0021]	-
delta-BHC	SW8081B	µg/L	NE			ND [0.0046]	ND [0.0045]	ND [0.0046] J-	-	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0046]	-
Dieldrin	SW8081B	µg/L	0.053 (0.004)			0.65 [0.023]	0.24 [0.0045]	ND [0.0056] J-	-	ND [0.0045]	0.0029 [0.0045] J	ND [0.0045]	0.0043 [0.0045] J	0.021 [0.0045]	0.022 [0.0045]	1.5 [0.046]	-
Endosulfan I	SW8081B	µg/L	220			ND [0.0021]	ND [0.002]	ND [0.0021] J-	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.0021]	-
Endosulfan II	SW8081B	µg/L	220			0.001 [0.0021] J	0.0021 [0.002] J	ND [0.025] J-	-	0.0023 [0.002] J	0.0024 [0.002] J	0.0024 [0.002] J	0.0047 [0.002] J	0.0083 [0.002] J	0.0094 [0.002] J	ND [0.0021]	-
Endosulfan sulfate	SW8081B	µg/L	NE			ND [0.0021]	ND [0.002]	ND [0.014] J-	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.0023]	ND [0.0021]	-
Endrin	SW8081B	µg/L	2			0.0074 [0.0021] J	0.0071 [0.002] J	ND [0.0027] J-	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	1.5 [0.021]	-
Endrin aldehyde	SW8081B	µg/L	NE			ND [0.0046]	ND [0.0045]	0.0079 [0.0046] J-	-	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	0.0016 [0.0046] J	-
Endrin ketone	SW8081B	µg/L	NE			0.0059 [0.0021] J-	0.0073 [0.002] J-	ND [0.0021] J-	-	ND [0.002] J-	ND [0.002] J-	ND [0.002] J-	ND [0.002] J-	ND [0.002] J-	ND [0.002] J-	0.01 [0.0021] J-	-
gamma-BHC (Lindane)	SW8081B	µg/L	0.2			ND [0.0021]	ND [0.002]	ND [0.0043]	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	2.4 [0.021]	-
gamma-Chlordane	SW8081B	µg/L	2			ND [0.0046]	ND [0.0045]	ND [0.0063] J-	-	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	0.0019 [0.0046] J	-
Heptachlor	SW8081B	µg/L	0.4			ND [0.0011]	ND [0.001]	ND [0.0073]	-	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	0.79 [0.011]	-
Heptachlor epoxide	SW8081B	µg/L	0.2			ND [0.0021]	ND [0.002]	ND [0.0025] J-	-	0.0005 [0.002] J	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	1.2 [0.021]	-
Hexachlorobenzene	SW8081B	µg/L	1			ND [0.0021]	ND [0.002]	ND [0.0021]	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	3.1 [0.021]	-
Hexachlorobutadiene	SW8081B	µg/L	7.3			ND [0.013]	ND [0.013]	ND [0.013]	-	ND [0.013]	ND [0.013]	ND [0.013]	ND [0.013]	ND [0.013]	ND [0.013]	0.008 [0.013] J	-
Hexachloroethane	SW8081B	µg/L	40			ND [0.013]	ND [0.013]	ND [0.013]	-	ND [0.013]	ND [0.013]	ND [0.013]	ND [0.013]	ND [0.013]	ND [0.013]	ND [0.013]	-
Isodrin	SW8081B	µg/L	NE			ND [0.0021]	ND [0.002]	ND [0.0021]	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	0.0075 [0.0021] J	-
Methoxychlor	SW8081B	µg/L	40			ND [0.0021]	ND [0.002]	ND [0.0021] J-	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	2.8 [0.021]	-
Mirex	SW8081B	µg/L	NE			ND [0.0021]	ND [0.002]	ND [0.005]	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.0021]	-
Oxychlordane	SW8081B	µg/L	NE			ND [0.0021]	ND [0.002]	ND [0.0048]	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.0036]	-
Toxaphene	SW8081B	µg/L	3			ND [0.41]	ND [0.4]	ND [0.83] J	-	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.41]	-
trans-Nonachlor	SW8081B	µg/L	NE			ND [0.0021]	ND [0.002]	ND [0.0021] J-	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.0021]	-
1,1,1,2-Tetrachloroethane	SW8260C	µg/L	NE			ND [0.2]	-	ND [2] J-	ND [2]	-	-	-	-	-	-	-	ND [0.2]
1,1,1-Trichloroethane	SW8260C	µg/L	200			ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
1,1,2,2-Tetrachloroethane	SW8260C	µg/L	4.3			ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
1,1,2-Trichloroethane	SW8260C	µg/L	5			ND [0.4]	-	ND [4] J-	ND [4]	-	-	-	-	-	-	-	ND [0.4]
1,1-Dichloroethane	SW8260C	µg/L	7,300			ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
1,1-Dichloroethene	SW8260C	µg/L	7 (7)		200.0	0.34 [0.2] J	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
1,1-Dichloropropene	SW8260C	µg/L	NE			ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
1,2,3-Trichlorobenzene	SW8260C	µg/L	NE			ND [0.4]	-	ND [0.4]	ND [0.4]	-	-	-	-	-	-	-	ND [0.4]
1,2,3-Trichloropropane	SW8260C	µg/L	0.12			ND [0.5]	-	ND [0.5]	ND [0.5]	-	-	-	-	-	-	-	ND [0.5]
1,2,4-Trichlorobenzene	SW8260C	µg/L	70			ND [0.3]	-	ND [0.3]	ND [0.3]	-	-	-	-	-	-	-	ND [0.3]
1,2,4-Trimethylbenzene	SW8260C	µg/L	1,850	120.0	29.0	ND [0.2]	-	180 [2]	170 [2]	-	-	-	-	-	-	-	0.09 [0.2] J
1,2-Dibromo-3-chloropropane	SW8260C	µg/L	NE			ND [0.8]	-	ND [0.8]	ND [0.8]	-	-	-	-	-	-	-	ND [0.8]
1,2-Dibromoethane	SW8260C	µg/L	0.05			ND [0.2]	-	ND [2] J-	ND [2]	-	-	-	-	-	-	-	ND [0.2]
1,2-Dichlorobenzene	SW8260C	µg/L	600			ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
1,2-Dichloroethane	SW8260C	µg/L	5			ND [0.15]	-	ND [0.15]	ND [0.15]	-	-	-	-	-	-	-	ND [0.15]
1,2-Dichloropropane	SW8260C	µg/L	5			ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
1,3,5-Trimethylbenzene	SW8260C	µg/L	1,800	NIT	20.0	ND [0.2]	-	62 [0.2]	62 [0.2]	-	-	-	-	-	-	-	ND [0.2]
1,3-Dichlorobenzene	SW8260C	µg/L	3,300			ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
1,3-Dichloropropane	SW8260C	µg/L	8.5			ND [0.3]	-	ND [3] J-	ND [3]	-	-	-	-	-	-	-	ND [0.3]
1,4-Dichlorobenzene	SW8260C	µg/L	75			ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
2,2-Dichloropropane	SW8260C	µg/L	NE			ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
2-Butanone	SW8260C	µg/L	22,000			ND [4]	-	ND [4]	ND [4]	-	-	-	-	-	-	-	ND [4]
2-Chlorotoluene	SW8260C	µg/L	NE			ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
2-Hexanone	SW8260C	µg/L	NE			ND [10]	-	ND [100]	ND [100]	-	-	-	-	-	-	-	ND [10]
4-Chlorotoluene	SW8260C	µg/L	NE			ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
4-Isopropyltoluene	SW8260C	µg/L	NE			ND [0.2]	-	9.7 [0.2]	9.6 [0.2]	-	-	-	-	-	-	-	ND [0.2]
4-Methyl-2-pentanone	SW8260C	µg/L	2,900			ND [10]	-	ND [10]	ND [10]	-	-	-	-	-	-	-	ND [10]
Acetone	SW8260C	µg/L	33,000			ND [10]	-	ND [10]	ND [10]	-	-	-	-	-	-	-	ND [10]
Benzene	SW8260C	µg/L	5 (5)	370.0	14.0	0.44 [0.1] J	-	30 [0.1]	31 [0.1]	-	-	-	-	-	-	-	ND [0.1]
Bromobenzene	SW8260C	µg/L	NE			ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
Bromochloromethane	SW8260C	µg/L	NE			ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
Bromodichloromethane	SW8260C	µg/L	14			ND [0.3]	-	ND [0.3]	ND [0.3]	-	-	-	-	-	-	-	ND [0.3]
Bromoform	SW8260C	µg/L	110			ND [0.5]	-	ND [5] J-	ND [5]	-	-	-	-	-	-	-	ND [0.5]
Bromomethane	SW8260C	µg/L	51			ND [0.3]	-	ND [0.3]	ND [0.3]	-	-	-	-	-	-	-	ND [0.3]
Carbon disulfide	SW8260C	µg/L	3,700	2800.0	1240.0	ND [0.2]	-	0.08 [0.2] J	0.09 [0.2] J	-	-	-	-	-	-	-	ND [0.2]
Carbon tetrachloride	SW8260C	µg/L	5			ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
Chlorobenzene	SW8260C	µg/L	100			ND [0.2]	-	ND [2] J-	ND [2]	-	-	-	-	-	-	-	ND [0.2]
Chloroethane	SW8260C	µg/L	290			ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
Chloroform	SW8260C	µg/L	140			ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
Chloromethane	SW8260C	µg/L	66			ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
cis-1,2-Dichloroethene	SW8260C	µg/L	70	NIT	44.0	**100 [1]**	-	4.9 [0.2]	5.1 [0.2]	-	-	-	-	-	-	-	ND [0.2]
cis-1,3-Dichloropropene	SW8260C	µg/L	8.50			ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
Dibromochloromethane	SW8260C	µg/L	10			ND [0.5]	-	ND [5] J-	ND [5]	-	-	-	-	-	-	-	ND [0.5]
Dibromomethane	SW8260C	µg/L	370			ND [0.5]	-	ND [0.5]	ND [0.5]	-	-	-	-	-	-	-	ND [0.5]
Dichlorodifluoromethane	SW8260C	µg/L	7,300			ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
Ethylbenzene	SW8260C	µg/L	700	1200.0	30.0	ND [0.1]	-	12 [1]	12 [1]	-	-	-	-	-	-	-	ND [0.1]
Hexachlorobutadiene	SW8260C	µg/L	7.3			ND [0.3]	-	ND [0.3]	ND [0.3]	-	-	-	-	-	-	-	ND [0.3]

Table A.8-6 Comparison of OU 1 2015 Groundwater Monitoring Results to Vapor Intrusion Screening Levels [1]

						1	3	4	6	8	9	10	11	12	13	14	15
Sample ID						15FWOU101WG	15FWOU102WG	15FWOU103WG	15FWOU104WG	15FWOU105WG	15FWOU106WG	15FWOU107WG	15FWOU108WG	15FWOU109WG	15FWOU110WG	15FWOU111WG	15FWOU112WQ
Location ID						AP-6326	AP-6331	AP-6327	AP-1010	AP-7279	AP-7282	AP-6630	AP-7284	AP-10042MW	AP-2020	AP-6001	Trip Blank
Sample Data Group						K1504900	K1504900	K1504900	K1504900	K1504900	K1504900	K1504900	K1504900	K1504900	K1504900	K1504900	K1504900
Laboratory ID						150490001F	K150490002	150490003F	150490004F	K150490005	K150490006	K150490007	K150490008	K150490009	K150490010	K150490011	K150490012
Collection Date						5/5/2015	5/5/2015	5/6/2015	5/6/2015	5/6/2015	5/7/2015	5/7/2015	5/7/2015	5/7/2015	5/7/2015	5/7/2015	5/5/2015
Matirx						WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
Sample Type						Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary	Primary	Primary	Field Duplicate	PE Sample	Trip Blank
Analyte	Method	Units	Cleanup Level[2]	USEPA VISL 2016 5° C (ILCR 1E-04, HQ 1)	ADEC VISL, residential 2012	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result[[LOD] Qualifier	Result[[LOD] Qualifier
Isopropylbenzene	SW8260C	µg/L	3,700			ND [0.2]	-	6.6 [2] J-	6.4 [2]	-	-	-	-	-	-	-	ND [0.2]
Methylene chloride	SW8260C	µg/L	5			ND [0.2]	-	ND [0.2]	ND [0.73]	-	-	-	-	-	-	-	ND [0.2]
Methyl-tert-butyl ether (MTBE)	SW8260C	µg/L	470			ND [0.3]	-	ND [0.3]	ND [0.3]	-	-	-	-	-	-	-	ND [0.3]
Naphthalene	SW8260C	µg/L	730	840.0	40.0	ND [0.3]	-	17 [0.3]	16 [0.3]	-	-	-	-	-	-	-	0.09 [0.3] J
n-Butylbenzene	SW8260C	µg/L	370			ND [0.1]	-	ND [5.8]	ND [5.8]	-	-	-	-	-	-	-	ND [0.1]
n-Propylbenzene	SW8260C	µg/L	370		2420.0	ND [0.2]	-	8.9 [0.2]	8.9 [0.2]	-	-	-	-	-	-	-	ND [0.2]
o-Xylene	SW8260C	µg/L	10,000		490.0	ND [0.2]	-	17 [2]	17 [2]	-	-	-	-	-	-	-	ND [0.2]
sec-Butylbenzene	SW8260C	µg/L	370		250.0	ND [0.1]	-	3.9 [0.1]	3.9 [0.1]	-	-	-	-	-	-	-	ND [0.1]
Styrene	SW8260C	µg/L	100			ND [0.2]	-	ND [2] J-	ND [2]	-	-	-	-	-	-	-	ND [0.2]
tert-Butylbenzene	SW8260C	µg/L	370		340.0	ND [0.2]	-	0.61 [0.2] J	0.58 [0.2] J	-	-	-	-	-	-	-	ND [0.2]
Tetrachloroethene (PCE)	SW8260C	µg/L	5		58.0	ND [0.2]	-	ND [2]	ND [2]	-	-	-	-	-	-	-	ND [0.2]
Toluene	SW8260C	µg/L	1,000	59000.0	19200.0	0.14 [0.1] J	-	3.9 [0.1]	4.1 [0.1]	-	-	-	-	-	-	-	ND [0.1]
trans-1,2-Dichloroethene	SW8260C	µg/L	100	NIT	380.0	1.8 [0.2]	-	0.15 [0.2] J	0.14 [0.2] J	-	-	-	-	-	-	-	ND [0.2]
trans-1,3-Dichloropropene	SW8260C	µg/L	8.50			ND [0.2]	-	ND [2] J-	ND [2]	-	-	-	-	-	-	-	ND [0.2]
Trichloroethene (TCE)	SW8260C	µg/L	5	15.0	5.2	0.23 [0.1] J	-	ND [0.1]	ND [0.1]	-	-	-	-	-	-	-	ND [0.1]
Trichlorofluoromethane	SW8260C	µg/L	11,000			ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
Vinyl chloride	SW8260C	µg/L	2 (2)	27.00	1.40	ND [0.1]	-	0.32 [0.1] J	0.34 [0.1] J	-	-	-	-	-	-	-	ND [0.1]
Xylene, Isomers m & p	SW8260C	µg/L	10,000		490.0	ND [0.2]	-	54 [2]	53 [2]	-	-	-	-	-	-	-	ND [0.2]

Notes:

1	Taken from Draft 2015 Groundwater Sample Results (FES Table A-2, Operable Unit 1, 801 Drum Burial Site Fort Wainwright, Alaska)
2	The ADEC cleanup level is the most stringent soil cleanup level from 18 AAC 75.341 (below 40 inches). The ROD Cleanup levels for the five OU1 contaminants of concern are shown in parentheses.
J	Estimated value
ND	Not detected [detection limit in btackets]
NIT	"No inhalation toxicity criteria" (e.g.,not a vapor intrusion inhalation risk)
WG	Groundwater
µg/L	micrograms per liter
	VISL is exceeded

Table A.8-7. OU-2 Groundwater Sample Results Former Building 1168 Compared to VISL. (From FES Draft 2014 OU 2 Monitoring Report, May 2015, Table 5-1).

Well Number	Relative Location	Sample Number	Date	Water Elevation (feet NGVD29)	ORP (mV)	Dissolved Oxygen (mg/L)	pH	Conductivity (mS/cm)	Dissolved Iron (mg/L)	Sulfate (mg/L)	Gasoline Range Organics (µg/L)	Diesel Range Organics (µg/L)	Residual Range Organics (µg/L)	ROD Chemicals of Concern (µg/L)						
														Benzene	TCE	PCE	Vinyl Chloride	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE
ROD CLEANUP LEVELS (3-Party Site)											2200	1500	1100	**5**	**5**	**5**	**2**	**7**	**70**	**70**
USEPA VISL 5° C													EPA VISL 5° C	**370**	**15**	**190**	**27**	**430**	**NIT**	**NIT**
ADEC VISL													ADEC VISL	**14**	**5.2**	**58**	**1.4**	**200**	**44**	**380**
AP-5751	Upgradient	11FW2H05WG	1/27/2011	426.19	-42.6	0.5	6.20	0.622	NA	NA	410	**7,400**	640	0.4 J	0.49 J	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
		11FW2H09WG-A	6/1/2011	427.78	66.3	0.7	6.07	0.347	5.79	7.49	370	**3,300 ML**	810	0.28 J	0.49 J	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
		11FW2H09WG-B[3]							0.03	22.4	120	**3,000**	560 J	0.07 J	ND(0.5)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
		11FW2H08WG-B	8/12/2011	428.03	50.6	2.5	6.22	0.59	0.04	22.3	120	**2,900**	520 J	0.08 J	0.11 J	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
		11FW2H14WG	9/21/2011	428.71	6.9	2.5	6.16	0.576	0.70 J	27.1	130	**2,600**	660 QH	0.07 J	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
		12FW2H02WG	8/22/2012	427.13	101.9	3.6	6.34	0.481	0.51	11.7	110	1,300	270 J,Q	0.09 J	ND(0.10)	ND(0.20)	ND(0.10)	ND(0.20)	ND(0.20)	ND(0.20)
		13FW2H01WG	5/2/2013	426.06	-24.2	0.3	6.07	0.502	5.95	13.5	350 B	**4,520**	850	0.41	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU204WG	10/9/2014	429.12	169	0.6	6.25	0.913	ND(0.25)	33.8	ND(50)	1,210	786	ND(0.2)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
PS-23	Source Area	10FW2H02WG	6/2/2010	NA	-87.2	0.8	6.55	0.802	30.70	22.7	430	1,300 QL	180 J	**15**	0.86	ND(0.5)	ND(0.5)	ND(0.5)	0.27 J	ND(0.5)
		10FW2H03WG[3]							NA	NA	420	1,300 QL	190 J	**15**	0.85	ND(0.5)	ND(0.5)	ND(0.5)	0.26 J	ND(0.5)
AP-10037MW		10FW2H05WG	7/28/2010	NM	NM	NM	NM	NM	12.40	24.9	260	1,200	140 J,B	1.4	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	0.080 J	ND(0.5)
		10FW2H07WG	9/28/2010	427.05	24.4	0.8	6.43	0.933	NA	NA	160	**1,600**	320 J,B	0.9	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
		10FW2H09WG	11/15/2010	NM	178.6	12.9[2]	8.07	2.590	0.62	295	55 J	810 J,QL	190 J,Q	0.5 J	0.13 J	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
		11FW2H01WG	1/24/2011	426.23	-100.0	1.0	6.88	3.275	3.90	366	61 J	640 J	210 J	0.3 J	0.15 J	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
		11FW2H06WG-A	6/1/2011	427.80	-62.3	0.7	6.97	2.178	5.63	128	73 J	**1,500**	380 J	0.4 J	0.33 J	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
		11FW2H07WG-A[3]								128	77 J	**1,500**	420 J	0.4 J	0.34 J	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
		11FW2H07WG-B	8/12/2011	428.08	5.5	1.0	7.03	1.981	6.18	122	67 J	1,100	250 J	0.6	0.30 J	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
		11FW2H12WG	9/21/2011	428.75	-93.3	2.3	7.06	2.12	7.09 J	144	75 J	1,300	440 J,QH	0.5	0.21 J	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
		11FW2H13WG[3]							6.86 J,QL	143	75 J	1,100	380 J,QH	0.5	0.23 J	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
		12FW2H03WG	8/22/2012	427.15	-40.6	4.0	7.17	2.179	8.21 QL	63.0	110	860	73 J,Q	1.3	ND(0.10)	ND(0.20)	ND(0.10)	ND(0.20)	ND(0.20)	ND(0.20)
		12FW2H04WG[3]							8.27 QL	63.1	110	1,110	120 J,Q	1.3	ND(0.10)	ND(0.20)	ND(0.10)	ND(0.20)	ND(0.20)	ND(0.20)
		13FW2H02WG	5/2/2013	426.08	-107.6	0.3	6.85	1.686	8 QL	38.9	126 B	**1,760**	774 Q	1.6	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		13FW2H03WG[3]							7.77	48.7	129 B	**1,550**	527 Q	1.8	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU201WG	10/9/2014	429.13	209.5	0.7	7.2	3.758	ND(0.25) J-,J	185.0	32.5 J,B	773	490 J	ND(0.2)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(500)
		14FWOU202WG							0.15 J-, J	188.0	33.7 J	990	637	ND(0.2)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
AP-6809	Downgradient	10FW2H04WG	6/2/2010	426.51	-10.3	1.3	6.34	0.970	NA	NA	66 J	1,000 QL	340 J	1.3	0.54	ND(0.5)	ND(0.5)	ND(0.5)	0.18 J	ND(0.5)
		10FW2H06WG	9/28/2010	426.88	144.8	0.8	6.08	1.017	NA	NA	34 J	1,300	280 J,B	0.7	0.28 J	ND(0.5)	ND(0.5)	ND(0.5)	0.08 J	ND(0.5)
		10FW2H10WG	11/15/2010	NM	170.6	0.7	6.50	1.172	NA	NA	21 J	870 ML,QL	150 J,B,Q	0.5 J	0.25 J	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
		11FW2H02WG	1/24/2011	426.06	77.8	0.4	6.32	1.004	NA	NA	39 J	1,400	200 J	1.0	0.32 J	ND(0.50)	ND(0.50)	ND(0.50)	0.11 J	ND(0.50)
		11FW2H03WG[3]							NA	NA	39 J	1,400	190 J	0.9	0.31 J	ND(0.50)	ND(0.50)	ND(0.50)	0.09 J	ND(0.50)
		11FW2H08WG-A	6/1/2011	427.61	143.2	0.8	6.24	0.756	5.54	35.3	72 J	**2,100**	290 J	0.7	0.29 J	ND(0.50)	ND(0.50)	ND(0.50)	0.11 J	ND(0.50)
		11FW2H06WG-B	8/12/2011	427.82	61.1	1.3	6.17	0.766	1.68	40.5	53 J	1,300	170 J,B	0.7	0.24 J	ND(0.50)	ND(0.50)	ND(0.50)	0.11 J	ND(0.50)
		11FW2H11WG	9/21/2011	428.56	8.3	2.3	6.26	0.774	1.39 J	53.6	41 J,B	**1,600 ML**	260 J,B,QH	0.8	0.22 J	ND(0.50)	ND(0.50)	ND(0.50)	0.08 J	ND(0.50)
		12FW2H01WG	8/22/2012	427.00	80.2	1.4	6.45	1.017	3.19	61.4	36 J	1,200 ML	110 J,Q	0.6	0.12J	ND(0.20)	ND(0.10)	ND(0.20)	ND(0.20)	ND(0.20)
		13FW2H04WG	5/2/2013	425.92	41.3	0.3	6.33	1.005	0.96 J	80.3	56 J,B	**1,630**	479 J	0.6	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU203WG	10/9/2014	428.98	181.4	1.0	6.36	1.254	ND(0.25)	102	ND(50)	ND(318)	0.232 J	ND(0.2)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)

Notes:

ADCE	Alaska Department of Environmental Conservation
DCE	dichloroethene
PCE	tetrachlorowthene
ROD	Record of Decision
TCE	trichloroethene
VISL	vapor intrusion screening level
mg/L	millirgams per liter
mS/cm	microSiemens per centimeter
mV	millivolts
µg/L	micrograms per liter
	VISL is exceeded

Table A.8-8 OU-2 Groundwater Results from DMRO Yard, Compared to VISL (From Draft 2014 OU 2 Monitoring Report, May 2015, Tables 3-3 and 4-1)

DRMO-4 (3-Party) Sub-Area

Well Number	Relative Location	Sample Number	Date	Water Elevation (ft NGVD29)	ORP (mV)	Dissolved Oxygen (mg/L)	pH	Conductivity (mS/cm)	Dissolved Iron (mg/L)	Sulfate (mg/L)	Alkalinity (mg/L)	Total Organic Carbon (mg/L)	Diesel Range Organics (µg/L)	ROD Contaminantss of Concern (µg/L)						
														Benzene	TCE	PCE	Vinyl Chloride	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE
ROD CLEANUP LEVELS													**1,500**	5	5	5	2	7	70	
USEPA Vapor Intrusion Screening Levels														370	15	190	27	430	NIT	NIT
ADEC Vapor Intrusion Screening Levels														14	5.2	58	1.4	200	44	380
AP-8916	Upgradient	10FW2C02WG	2/11/10	441.76	1.7	1.21	7.4	0.414	8.4	6.9	194	4.2	NA	ND(0.5)	ND(0.5)	2.0	ND(0.5)	ND(0.5)	0.25 J	ND(0.5)
		10FW2C04WG	6/2/10	442.25	-97.5	0.59	6.9	0.474	8.4	6.9	238	4.5	NA	0.34 J,QL	0.52 QL	1.9 QL	ND(0.5)	ND(0.5)	0.28 J,QL	ND(0.5)
		10FW2C08WG	10/12/10	442.64	-63.9	0.64	6.6	0.380	NA	NA	224	7.6	1,000 Q	0.59	1.50	4.0	ND(0.5)	ND(0.5)	0.23 J	ND(0.5)
		11FW2C02WG	6/3/2011	443.22	61.0	1.02	6.4	0.538	6.0	17.3	243	4.3	NA	ND(0.5)	1.2 QH	**9.2 QH**	ND(0.5)	ND(0.5)	0.2 J,QH	ND(0.5)
		11FW2C04WG	9/20/2011	443.73	28.7	2.37	5.6	0.453	1.92 J	22.2	206	3.9	170 J	0.09 J	0.65	**6.1**	ND(0.5)	ND(0.5)	0.23 J	ND(0.5)
		11FW2C05WG2							1.76 J	22.5	217	3.5	200 J	0.08 J	0.68	**6.2**	ND(0.5)	ND(0.5)	0.24 J	ND(0.5)
		11FW2C08WG	10/27/2011	442.89	-94.5	0.59	5.8	1.233	80.6	8.9	493	720	NA	0.46 J,QH	0.77 QH	4.7 QH	ND(0.5)	ND(0.5)	ND(0.50)	ND(0.5)
		11FW2C09WG2							73.2 QL	8.6	466	619	NA	0.43 J,QH	0.67 QH	4.4 QH	ND(0.5)	ND(0.5)	ND(0.50)	ND(0.5)
		12FW2C03WG	5/31/2012	443.34	-55.3	0.26	6.1	1.056	108	0.38 J	293	261	NA	ND(0.7)	0.75 Q	2.7 J,ML,Q	ND(0.1)	ND(0.2)	0.26 J,Q	ND(0.2)
		12FW2C04WG2							110	0.5	304	264	NA	ND(0.49)	0.81 Q	2.3 J,Q	ND(0.1)	ND(0.2)	0.26 J,Q	ND(0.2)
		12FW2C07WG	8/22/2012	443.34	-98.7	0.13	6.1	1.010	125	0.6	307	207	**10,000**	0.26 J,QH	ND(0.1)	**5.1 QH**	ND(0.1)	ND(0.2)	0.26 J,QH	ND(0.2)
		12FW2C08WG2							126	0.5	307	198	**9,600**	0.28 J,QH	ND(0.1)	**5.7 QH**	ND(0.1)	ND(0.2)	0.27 J,QH	ND(0.2)
		13FW2C03WG	8/27/2013	443.45	-102.9	0.19	6.6	0.560	42.5	0.4	170	29.2	1,360	ND(0.24)	ND(0.62)	ND(0.62) Q	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		13FW2C04WG2							39.3	0.4	169	27.9	**1,530**	ND(0.24)	ND(0.62)	2.18 Q	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU215WG	10/9/2014	442.10	21.9	0.74	6.6	0.761	20.1	5.8	206	8.05	630	ND(0.200)	ND(0.500)	**6.7**	ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
PO5	Source Area	10FW2C01WG	2/11/10	NM	-12.9	10.59	6.9	0.407	NA	NA	189	3.6	NA	0.29 J	1.2	1.6	ND(0.5)	ND(0.5)	0.27 J	ND(0.5)
		10FW2C03WG	6/2/10	NM	-58.3	2.10	6.5	0.419	NA	NA	201	3.7	NA	0.39 J	0.7	1.0	ND(0.5)	ND(0.5)	0.26 J	ND(0.5)
		10FW2C05WG	10/11/10	NM	-25.3	2.25	6.6	0.350	5.4	24	201	4.8	140 J,Q	0.28 J	3.1	4.0	ND(0.5)	ND(0.5)	0.29 J	ND(0.5)
		10FW2C05WG2							NA	NA	NA	NA	150 J,Q	0.28 J	3.2	4.0	ND(0.5)	ND(0.5)	0.31 J	ND(0.5)
		11FW2C03WG	6/6/2011	NM	5.0	5.73	6.3	0.422	5.0	24.6	165	3.1	NA	0.09 J	0.97	1.7	ND(0.5)	ND(0.5)	0.28 J	ND(0.5)
		11FW2C06WG	9/20/2011	NM	-56.9	1.55	6.6	0.434	5.1	30.3	181	3.8	120 J	0.11 J	3.8	**6.6**	ND(0.5)	ND(0.5)	0.49 J	0.07 J
		11FW2C10WG	10/27/2011	NM	-76.1	0.19	6.8	0.433	5.1	37.4	205	3.8	NA	0.11J	3.6	**7.9**	ND(0.5)	ND(0.5)	0.40 J	ND(0.5)
		12FW2C02WG	5/31/2012	NM	-63.9	0.21	6.8	0.432	4.5	23.4	158	2.3	NA	0.28 J	1.3	1.1	ND(0.1)	ND(0.2)	0.38 J	0.13 J
		12FW2C06WG	8/22/2012	NM	-74.5	0.15	6.8	0.468	4.9	26.4	227	2.6	83 J	0.10 J	4.2	3.8	ND(0.1)	ND(0.2)	0.51	0.26 J
		13FW2C02WG	8/27/2013	NM	-76.4	0.74	6.8	0.421	4.7	25.1	156	2.8	ND(0.39)	ND(0.24)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU211WG	10/9/2014	NM	16.5	4.7	6.5	0.501	5.1	28.4	213	4.7	228 J	ND(0.200)	4.63	**7.28**	ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
Probe B	Downgradient	10FW2C07WG	10/11/10	442.36	26.2	1.10	6.6	0.438	NA	NA	273	22.7	**2,600 Q**	0.12 J	0.16 J	0.10 J	ND(0.5)	ND(0.5)	0.23 J	0.29 J
		11FW2C01WG	6/3/2011	442.78	111.8	1.02	6.3	0.569	4.6	29.2	267	3.6	NA	0.09 J	0.11 J	ND(0.5)	ND(0.5)	ND(0.5)	0.19 J	0.08 J
		11FW2C07WG	9/20/2011	443.46	-15.0	2.29	6.4	0.609	1.8 J	36.5	312	16.5	**4500**	0.07 J	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	0.13 J	ND(0.5)
		11FW2C11WG	10/27/2011	442.53	19.5	0.47	6.6	0.534	2.9	34.0	264	7.4	NA	0.090 J	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	0.21 J	0.070 J
		12FW2C01WG	5/31/2012	443.01	-13.6	0.33	6.4	0.716	4.6	40.2	330	3.8	NA	0.22 J	0.13 J	ND(0.2)	ND(0.1)	ND(0.2)	0.14 J	ND(0.2)
		12FW2C05WG	8/22/2012	442.98	-7.0	0.26	6.5	0.733	2.5	40.0	387	11.0	**2,200**	0.08 J	ND(0.1)	ND(0.2)	ND(0.1)	ND(0.2)	0.17 J	ND(0.2)
		13FW2C01WG	8/26/2013	443.13	-34.6	0.26	6.3	0.545	3.2	30.0	213	3.3	299 J	ND(0.24)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU210WG	10/9/2014	443.87	30.3	0.5	6.5	0.903	5.5	67.6	442	19.3	**2,320**	ND(0.200)	ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)

DRMO1, DRMO5, and Building 5010 Two-Party Sub-Areas

DRMO1 Two-Party Treatment System Area Wells

Well Number	Relative Location	Sample Number	Date	Water Elevation (ft NGVD29)	ORP (mV)	Dissolved Oxygen (mg/L)	pH	Conductivity (mS/cm)	Dissolved Iron (mg/L)	Sulfate (mg/L)	Alkalinity (mg/L)	Total Organic Carbon (mg/L)	Diesel Range Organics (µg/L)	Benzene	TCE	PCE	Vinyl Chloride	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE
AP-5826		09FW2D02WG	5/20/2009	443.47	-15.6	0.7			NA	NA			1,000	NA	NA	NA	NA	NA	NA	NA
		10FW2D03WG	6/2/2010	442.50	-74.8	0.3			NA	NA			**3,900 QL**	NA	NA	NA	NA	NA	NA	NA
		11FW2D02WG	6/3/2011	443.40	84.6	0.8			2.2	20.7			**1,600**	NA	NA	NA	NA	NA	NA	NA
MP-4		09FW2D01WG	5/19/2009	443.26	-41.4	1.4			NA	NA			**5,300**	NA	NA	NA	NA	NA	NA	NA
		10FW2D01WG	6/1/2010	442.34	-80.4	0.4			NA	NA			**2,400 QL**	NA	NA	NA	NA	NA	NA	NA
		10FW2D01WG2							NA	NA			**2,400 QL**	NA	NA	NA	NA	NA	NA	NA
		11FW2D01WG	6/2/2011	443.29	50.4	0.9			10.9	4.1			**8,000**	NA	NA	NA	NA	NA	NA	NA

DRMO5 Two-Party Treatment System Area Wells

Well Number	Relative Location	Sample Number	Date	Water Elevation (ft NGVD29)	ORP (mV)	Dissolved Oxygen (mg/L)	pH	Conductivity (mS/cm)	Dissolved Iron (mg/L)	Sulfate (mg/L)	Alkalinity (mg/L)	Total Organic Carbon (mg/L)	Diesel Range Organics (µg/L)	Benzene	TCE	PCE	Vinyl Chloride	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE
PI-3		09FW2E01WG	5/19/2009	442.55	35.2	1.5			NA	NA			**2,700**	NA	NA	NA	NA	NA	NA	NA
		10FW2E02WG	6/1/2010	441.90	-87.6	0.5			NA	NA			690 QL	NA	NA	NA	NA	NA	NA	NA
		11FW2E01WG	6/2/2011	442.83	46.7	1.3			9.0	28.7			**2,700**	NA	NA	NA	NA	NA	NA	NA
AP-6806		09FW2E02WG	5/19/2009	442.57	2.1	1.0			NA	NA			**8,200**	NA	NA	NA	NA	NA	NA	NA
		10FW2E01WG	6/1/2010	441.59	-109.5	0.5			NA	NA			**2,000 QL**	NA	NA	NA	NA	NA	NA	NA
		11FW2E02WG	6/3/2011	442.51	45.6	0.9			15.7	26.2			**9,300**	NA	NA	NA	NA	NA	NA	NA

Building 5010 Wells

Well Number	Relative Location	Sample Number	Date	Water Elevation (ft NGVD29)	ORP (mV)	Dissolved Oxygen (mg/L)	pH	Conductivity (mS/cm)	Dissolved Iron (mg/L)	Sulfate (mg/L)	Alkalinity (mg/L)	Total Organic Carbon (mg/L)	Diesel Range Organics (µg/L)	Benzene	TCE	PCE	Vinyl Chloride	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE
AP-7346		09FW2F02WG	5/20/2009	444.01	-22.5	1.36			NA	NA			100 J	ND(1)	ND(1)	ND(1) QL	ND(1)	ND(1)	ND(1)	ND(1)
		10FW2F01WG	6/2/2010	442.83	-60.1	0.4			NA	NA			89 J,QL	0.080 J	0.48 J	ND(0.5)	ND(0.5)	ND(0.5)	0.40 J	0.16 J
		11FW2F02WG	6/6/2011	443.56	30.3	0.9			0.5	21.3			66 J	0.07 J	0.39 J	ND(0.50)	ND(0.50)	ND(0.50)	0.35 J	0.17 J
		12FW2F01WG	8/23/2012	443.92	19.7	0.2			0.2	30.9			62 J,B	ND(0.10)	0.7	ND(0.20)	ND(0.10)	ND(0.20)	0.64	0.4 J
		13FW2F01WG	5/6/2013	442.50	-14.2	0.4			NA	NA			ND(376)	ND(0.24)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		13FW2F02WG2							NA	NA			ND(410)	ND(0.24)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU216WG	10/10/2014	444.78	136	1.7			NA	NA			ND(300)	ND(0.2)	0.41 J	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)

Table A.8-8 OU-2 Groundwater Results from DMRO Yard, Compared to VISL (From Draft 2014 OU 2 Monitoring Report, May 2015, Tables 3-3 and 4-1)

DRMO-4 (3-Party) Sub-Area

														ROD Contaminantss of Concern (µg/L)						
Well Number	Relative Location	Sample Number	Date	Water Elevation (ft NGVD29)	ORP (mV)	Dissolved Oxygen (mg/L)	pH	Conductivity (mS/cm)	Dissolved Iron (mg/L)	Sulfate (mg/L)	Alkalinity (mg/L)	Total Organic Carbon (mg/L)	Diesel Range Organics (µg/L)	Benzene	TCE	PCE	Vinyl Chloride	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE
ROD CLEANUP LEVELS													**1,500**	**5**	**5**	**5**	**2**	**7**	**70**	
USEPA Vapor Intrusion Screening Levels														**370**	**15**	**190**	**27**	**430**	**NIT**	**NIT**
ADEC Vapor Intrusion Screening Levels														**14**	**5.2**	**58**	**1.4**	**200**	**44**	**380**
AP-7348		09FW2F01WG	5/20/2009	443.82	-54.1	0.62			NA	NA			10,000	ND(1)	ND(1)	ND(1) QL	ND(1)	ND(1)	ND(1)	ND(1)
		10FW2F02WG	6/2/2010	442.86	-99.7	0.4			NA	NA			**11,000 QL**	1.2	0.19 J	ND(0.5)	ND(0.5)	ND(0.5)	0.40 J	ND(0.5)
		11FW2F01WG	6/3/2011	443.76	-10.5	0.7			30.7	8.9			**7,000**	0.6	0.16 J	ND(0.50)	ND(0.50)	ND(0.50)	0.56	0.09 J
		12FW2F02WG	8/23/2012	443.87	-86.3	0.1			56.1	0.8			**29,000**	2.2	0.15 J	ND(0.20)	ND(0.10)	ND(0.20)	0.42 J	0.12 J
		12FW2F03WG2							56.2	0.9			**31,000**	2.2	0.16 J	ND(0.20)	ND(0.10)	ND(0.20)	0.39 J	0.10 J
		13FW2F03WG	5/6/2013	442.44	-93.1	0.2			NA	NA			**14,500**	0.6	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU218WG	10/10/2014	444.74	-0.2	0.4			NA	NA			**4,810**	ND(0.2)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)

Notes:

VISL is exceeded

Analytes exceeding remedial action goals (RAGs) established in the Record of Decision (ROD) or ADEC groundwater cleanup levels (from Table C of 18 AAC 75) are in bold type and gray shading. ROD chemicals of concern analyzed by EPA Method 8260C.

1 Cleanup goal listed is an ADEC cleanup level and is not listed in the OU2 ROD.

2 Sample is a Field Duplicate of the sample immediately above.

B - analytical result is qualified as a potential high estimate due to contamination present in a blank sample

btoc - below top of casing

DCE - dichloroethene

J - analyte is reported between the detection limit and LOQ indicated with a "L" (low) or "H" (high).

LOD - limit of detection

LOQ - limit of quantitation

NA - not analyzed or not applicable

ND - not detected at the detection limit (LOD in parentheses. LOQ in parentheses for data prior to 2012.)

msl - mean seal level

mS/cm - milliSiemens per cemtimeter

mg/L - milligrams per liter

mV - millivolts

PCE - tetrachloroethene

TCE - trichloroethene

Q - result considered an estimate due to a quality control failure. If direction of bias is known, it is further

µg/L - micrograms per liter

Table A.8-9 Summary of Risk-Based Cleanup Goals and Toxicity Criteria for Trimethylbenzenes in Operable Unit 3

Constituent of Concern	1996 ROD Cleanup Goal Concentration μg/L	1996 ROD toxicity criteria, source and date[1]	2002 ESD Concentration μg/L	2002 ESD toxicity criteria, source and date[2]	EPA Current 2015 tapwater RSL (HQ=1) μg/L	Provisional toxicity criteria, source and date (values available during drafting of report, December 2015)
1,2,4-Trimethyl benzene	14	pRfDo: 5E-04 mg/kg-day (EPA ECA 1994) pRfDi: 5E-04 mg/kg-day (EPA ECA 1994) *pRfCi equivalent: 1.75E-03 mg/m³*	1,850	RfDo: 5.0E-02 mg/kg-day (NCEA 2002) RfDi: 1.7E-03 mg/kg-day (NCEA 2002) *RfCi equivalent: 5.95E-03 mg/m³*	15	RfDo or pRfDo: Not available (none derived) pRfCi: 7.0E-03 mg/m³ (PPRTV 2007)
1,3,5- Trimethyl benzene	12	pRfDo: 4E-04 mg/kg-day (EPA ECA 1994) pRfDi: 4E-04 mg/kg-day (EPA ECA 1994) *pRfCi equivalent: 1.40E-03 mg/m³*	1,850	RfDo: 5.0E-02 mg/kg-day (NCEA 2002) RfDi: 1.7E-03 mg/kg-day (NCEA 2002) *RfCi equivalent: 5.95E-03 mg/m³*	120	pRfDo: 1.0E-02 mg/kd-day (PPRTV Appendix 2009) subchronic pRfCi = 1E-02 mg/m³ (PPRTV 2009)

Notes:

1	The ROD toxicity criteria is assumed to be equal to that used in the 1994 OU-3 Risk Assessment
2	The toxicity criteria used as the basis of the 2002 ESD risk-based concentrations were not presented in the ESD. These toxicity criteria are inferred from a 2002 EPA Region 9 Preliminary Remediation Goals table.
EPA ECA	USEPA's Environmental Criteria and Assessment Office
ESD	Explanation of Significant Differences
HQ	Hazard Quotent
NCEA	USEPA's National Center for Exposure Assessment
PPRTV	USEPA's Provisional Peer Reviewed Toxicity Value
ROD	Record of Decision
RfDi	Non-cancer inhalation reference dose (mg/kg-day), now superceded by inhalation reference concentration. "p" indicates a provisional value.
RfCi	Non-cancer inhalation reference concentration (mg/m3), which is equivalent to the RfDi x (70 kg / 20 m3/day). "p" indicates a provisional value.
RfDo	Non-cancer ingestion reference dose (mg/kg-day). "p" indicates a provisional value.
RSL	USEPA's Regional (risk-based) Screening Level

Table A.8-10 Comparison of Off-Site Groundwater Sample Results in Alluvial and Bedrock Monitoring Wells with Vapor Intrusion Screening Levels from 2014 Monitoring Report, FES 2015a (Tables 2-5 and 2-7)

Birch Hill Tank Farm

Probe/Well Number	Sample Number	Date	Water Elevation (ft msl)	Dissolved Oxygen (mg/L)	ROD Contaminants of Concern (µg/L) Benzene	Toluene	Ethylbenzene	1,2,4-TMB	1,3,5-TMB	1,2-DCE	1,2-EDB
ROD CLEANUP LEVELS (MCLs)					**5**	**1,000**	**700**	**1,850**	**1,850**	**5**	**0.05**
USEPA VISL (at 5 degrees C)					**370.0**	**59,000**	**1200.0**	**120**	**NIT**	**430.0**	**61.00**
ADEC VISL					**14**	**19,200**	**12**	**29**	**20**	**19**	**1.50**
	10FWTH01WG	2/10/2010	424.57	1.08	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	0.35 J	ND(0.02)
	10FWTH06WG	6/22/2010	424.82	0.68	ND(1)	0.12 J	ND(1)	ND(1)	ND(1)	ND(1)	ND(0.01) QL
	10FWTH26WG	8/17/2010	425.53	0.43	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	0.37 J	ND(0.01)
	10FWTH31WG	11/9/2010	424.95	0.45	ND(1)	0.27 J ,B,QH	ND(1)	ND(1)	ND(1)	0.41 J, QH	ND(0.019)
	10FWTH32WG[2]	11/9/2010	424.95		ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	0.4 J	ND(0.020)
ALLUVIAL WELL AP-9958	11FW3BH03WG	6/30/2011	425.79	0.72							
	11FW3BH71WG	10/6/2011	426.84	1.85	ND(1) NA NA	ND(1) NA NA	ND(1) NA NA	ND(1) NA NA	ND(1) NA NA	ND(1) NA NA	ND(1) NA NA
	11FW3BH72WG[2]	10/6/2011	426.84								
	12FW3BHA01WG	9/25/2012	425.95	0.16	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	0.34 J	ND(0.2)
	13FW3BHA08WG	6/11/2013	425.73	1.79	ND(0.2)	ND(0.4)	ND(0.2)	0.48 J	0.19 J	0.41 J	ND(0.2)
	14FWOU343WG	10/15/2014	429.51	0.56	ND(0.1)	0.07 J	ND(0.1)	ND(0.2)	ND(0.2)	0.26 J	ND(0.2)
	14FWOU344WG	10/15/2014	429.51	0.56	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.2)	ND(0.2)	0.25 J	ND(0.2)
	10FWTH05WG	2/10/2010	424.51	1.33	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	1.4	ND(0.02)
	10FWTH09WG	6/22/2010	424.77	0.40	ND(1)	0.12 J	ND(1)	ND(1)	ND(1)	1.5	ND(0.01) QL
	10FWTH29WG	8/17/2010	425.42	0.14	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	1.3	ND(0.010)
	10FWTH34WG	11/9/2010	424.87	0.44	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	1.4	ND(0.020)
ALLUVIAL WELL AP-9956	11FW3BH05WG	6/30/2011	425.80	0.79	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	1.1	ND(1)
	11FW3BH73WG	10/6/2011	426.78	2.04	NA	NA	NA	NA	NA	NA	NA
	12FW3BHA02WG	9/25/2012	425.89	0.19	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	1.1	ND(0.2)
	13FW3BHA07WG	6/11/2013	425.72	2.01	ND(0.2)	0.18 J	ND(0.2)	ND(0.2)	ND(0.4)	1.2	ND(0.2)
	14FWOU345WG	10/15/2014	429.36	0.41	ND(0.1)	0.06 J	ND(0.1)	ND(0.2)	ND(0.2)	1.3	ND(0.2)
	10FWTH04WG	2/10/2010	424.48	1.41	ND(1)	ND(1)	0.15 J	ND(1)	ND(1)	0.62 J	ND(0.02)
	10FWTH08WG	6/22/2010	424.77	0.18	ND(1)	0.12 J, Q	ND(1)	0.060 J	ND(1)	ND(1) Q	ND(0.01) QL
	10FWTH13WG[2]	6/22/2010	424.77	0.18	ND(1)	0.19 J	ND(1)	ND(1)	ND(1)	0.71 J	ND(0.01) QL
	10FWTH30WG	8/17/2010	425.28	0.11	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	0.61 J	ND(0.10)
	10FWTH35WG	11/9/2010	424.89	0.65	ND(1)	ND(1)	0.11 J,QH	ND(1)	ND(1)	0.76 J, QH	ND(0.021)
BEDROCK well AP-9957	11FW3BH06WG	6/30/2011	425.68	0.86	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(0.02)
	11FW3BH08WG[2]	6/30/2011	425.68	0.86	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(0.02)
	12FW3BHB06WG	9/25/2012	425.87	0.19	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	0.84 J	ND(0.2)
	12FW3BHB07WG[2]	9/25/2012	425.87	0.19	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	0.83 J	ND(0.2)
	13FW3BHB42WG	6/11/2013	425.68	1.70	ND(0.2)	0.21 J	ND(0.2)	ND(0.2)	ND(0.4)	0.63 J	ND(0.2)
	14FWOU346WG	10/15/2014	429.80	0.44	ND(0.1)	0.11 J	ND(0.1)	ND(0.2)	ND(0.2)	0.73 J	ND(0.2)
	10FWTH02WG	2/10/2010	425.31	0.88	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	0.75 J	ND(0.02)
	10FWTH03WG[2]	2/10/2010	425.31	0.88	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	0.72 J	ND(0.02)
	10FWTH07WG	6/22/2010	425.52	0.28	ND(1)	0.18 J	ND(1)	ND(1)	ND(1)	0.78 J	ND(0.01) QL
	10FWTH27WG	8/17/2010	426.25	0.11	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	0.81 J	ND(0.02)
	10FWTH28WG[2]	8/17/2010	426.25	0.11	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	0.75 J	ND(0.019)
BEDROCK WELL AP-9959	10FWTH33WG	11/9/2010	425.69	0.61	ND(1)	ND(1) B,QH ND(1)	ND(1)	ND(1)	ND(1)	0.61 J,QH	ND(0.20)
	11FW3BH04WG	6/30/2011	426.55	1.26	ND(1)		ND(1)	ND(1)	ND(1)	0.72 J	ND(0.02)
	12FW3BHB05WG	9/25/2012	426.64	0.29	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	0.91 J	ND(0.2)
	13FW3BHB43WG	6/11/2013	426.48	1.51	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	0.72 J	ND(0.2)
	13FW3BHB44WG[2]	6/11/2013	426.48	1.51	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	0.69 J	ND(0.2)
	14FWOU341WG	10/15/2014	430.25	0.33	ND(0.1)	0.06 J	ND(0.1)	ND(0.2)	ND(0.2)	0.62	ND(0.2)
	14FWOU342WG[2]	10/15/2014	430.25	0.33	ND(0.1)	0.07 J	ND(0.1)	ND(0.2)	ND(0.2)	0.60	ND(0.2)

Bold results represent concentrations in excess of remedial action goals

1 Replacement wells installed in November 2011. Wells that were replaced are shown in parentheses.

2 Denotes sample is a field duplicate of preceding row.

3 1,2-Dibromoethane results were generated from either Method 8260 or Method 504.1. Results from Method 504.1 were used when available. ND - not detected at the detection limit (LOQ in parentheses for data prior to 2012. LOD in parentheses for data staring in 2012.)

DCE - dichloroethene

DRO - Diesel Range organics

EDB - ethylene dibromide

ft - feet

LOD - Limit of Detection

LOQ - Limit of Quantitation

NA - not analyzed

NM - not measured

MCL - Maximum Contaminant Level

mg/L - milligrams per liter

msl - mean sea level

ROD - Record of Decision

TMB - trimethylbenzene

µg/L - micrograms per liter

Table A.8-11a Summary of Risk-Based Cleanup Goals for Operable Unit 4

ROD Date Cleanup Goal Identification	Constituent of Concern	Concentration	Units	Target ILCR for 1996 RBC	Current 2015 tapwater RSL (ILCR of 1E-06)	Current toxicity criteria source and date
Aug 1996	1,1,2,2-Tetrachloroethane	5.2	µg/L	1.00E-04	7.60E-02	IRIS 2010

Table A.8-11b Comparison of Toxicity Criteria for 1,1,2,2,-Tetrachloroethane

1,1,2,2-Tetrachloroethane	SF_O $(mg/kg\text{-}day)^{-1}$	Source of SFo	Inhalation Cancer Risk Factor (IUR or CSFi)	Units	Source of Inhalation Cancer Risk Factor	RfD_o (mg/kg-day)	Source of RfDo
2016 Toxicity Criteria	2.00E-01	IRIS	5.8E-05 (IUR)	$(ug/m^3)^{-1}$	California EPA	2.00E-02	IRIS
Previous Toxicity Criteria (circa 2003)	2.00E-01	IRIS	2.00E-01 (CSFi)	$(mg/kg\text{-}day)^{-1}$	IRIS	6.00E-02	EPA provisional value; National Center Exposure Assessment

Notes:

ILCR	incremental lifetime cancer risk
IRIS	Integrated Risk Information System
RBC	risk-based concentration
ROD	Record of Decision
RSL	Regional Screening Level
µg/L	micrograms per liter

The previous toxicity criteria were surmised from a 2003 edition of the EPA Region 3 Risk Based Concentration screening table, for which the tapwater RBC was 5.3 ug/L at a cancer risk limit of 1E-04

Table A.8-12 Summary of Risk-Based Cleanup Goals for Operable Unit 5

ROD Date Cleanup Goal Identification	Constituent of Concern	Concentration	Units	Target ILCR for 1996 RBC	Current 2016 tapwater RSL (ILCR of 1E-06)	Current toxicity criteria source and date
May 1999	bis(2-chloroethyl) ether	9.20E-03	µg/L	1.00E-06	1.40E-02	IRIS 1987

Notes:

ILCR	incremental lifetime cancer risk
RBC	risk-based concentration
ROD	Record of Decision
RSL	Regional Screening Level
µg/L	micrograms per liter

Table A.8-13 Summary of Risk-Based Cleanup Goals for Operable Unit 6

ROD Date Cleanup Goal Identification	Constituent of Concern	ROD Risk-Based Concentration	Units	Current 2016 EPA RSL	Current toxicity criteria source and date
Jan 2014	aluminum	7.70E+04	mg/kg	7.70E+04	PPRTV 2006
Jan 2014	manganese	1.80E+03	mg/kg	1.80E+03	IRIS 1993 (inhalation), IRIS 1995 (oral)

Notes:

RSL EPA regional risk-based screening level
ROD Record of Decision
mg/kg milligrams per kilogram

Table A.8-14 Comparison of Indoor Air Vapor Intrusion Screening Levels (ug/m3)

Compound	ADEC 2012	USEPA 2016
Xylene, Isomers m & p	100	100
1,1,1-Trichloroethane	5210	5200
1,1,2,2-Tetrachloroethane	0.42	0.48
1,1,2-Trichloroethane	0.21	0.21
1,1-Dichloroethane	15	18
1,1-Dichloroethene	210	210
1,2,3-Trichloropropane	0.31	0.31
1,2,4-Trichlorobenzene	2.1	2.1
1,2,4-Trimethylbenzene	7.3	7.3
1,2-Dibromoethane	0.041	0.047
1,2-Dichlorobenzene	210	210
1,2-Dichloroethane	0.94	1.1
1,2-Dichloropropane	2.4	2.8
1,3,5-Trimethylbenzene	7.3	NA
1,3-Dichlorobenzene	210	NA
1,4-Dichlorobenzene	2.2	2.6
2-Butanone	5210	5200
2-Hexanone	31	31
4-Methyl-2-pentanone	3130	3100
Acetone	32200	32000
Benzene	3.1	3.6
Bromodichloromethane	0.66	0.76
Bromoform	22	26
Bromomethane	5.2	5.2
Carbon disulfide	730	730
Carbon tetrachloride	4.1	4.7
Chlorobenzene	52	52
Chloroethane	10400	10000
Chloroform	1.1	1.2
cis-1,2-Dichloroethene	7.3	NA
cis-1,3-Dichloropropene	6.1	7
Dibromochloromethane	0.9	NA
Ethylbenzene	9.7	11
Hexachlorobutadiene	NA	1.3
Isopropylbenzene	420	420
Methylene chloride	52	630
Methyl-tert-butyl ether (MTBE)	94	110
Naphthalene	0.72	0.83
n-Butylbenzene	180	NA
n-Propylbenzene	1040	1000
o-Xylene	100	100
sec-Butylbenzene	180	NA
Styrene	1040	1000
tert-Butylbenzene	180	NA

Table A.8-14 Comparison of Indoor Air Vapor Intrusion Screening Levels (ug/m3)

Compound	ADEC 2012	USEPA 2016
Tetrachloroethene (PCE)	42	42
Toluene	5210	5200
trans-1,2-Dichloroethene	63	NA
trans-1,3-Dichloropropene	6.1	7
Trichloroethene (TCE)	2.1	2.1
Trichlorofluoromethane	730	NA
Vinyl chloride	1.6	1.7
Xylenes	100	100

Notes:
ADEC VISL are from ADEC 2012 Appendix D, for protection of residential exposure
The USEPA VISLs were developed using VISL calculator version 3.4.6, downloaded February 2016. http://www.epa.gov/vaporintrusion
Both VISL use a target cancer risk of 1E-05 and a hazard index of 1.

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ATTACHMENT 9

Public Notice

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The U.S. Army announces the 4th Five-Year Review for soil and groundwater remedies implemented at Operable Units (OUs) 1 through 6 on Fort Wainwright, Alaska (FWA).

Section 121 (c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (NCP) state "a remedial action that resulted in hazardous substances, pollutants, or contaminants remaining at the site shall be reviewed no less frequently than every five years." Thus CERCLA requires a statutory Five-Year Review of the selected remedial actions on FWA. The last Five-Year Review of OUs I through 6 was completed in September 2011.

The U.S. Army Corps of Engineers, Buffalo District (USACE) is conducting the 4th Five-Year Review for OUs 1 through 6 on FWA. The five-year review includes review of new data and information, inspection of the OUs, and interviews of stakeholders and interested community members. The objective of the review is to ensure that the completed or on-going remedies are protective of human health and the environment.

USACE initiated the Five-Year Review process in July 2015 and it will be completed by September 2016. The findings of the Five-Year Review will be available for public review after September 2016 at the three document repositories listed below. These three libraries contain detailed information concerning the selected remedies for OUs 1 through 6 and the contamination addressed by the remedies.

Contact Information: If you have any questions, comments, and/or concerns above the five-year review you may contact the following:

Sandra Halstead
USEPA, Federal Facilities
Alaska Operations Office
222 W. 7th Avenue, Box 19
Anchorage, AK 99513-7588
(907) 271-1218
halstead.sandra@epa.gov

Guy Warner
Alaska Department of Environmental Conservation

Joe Malen
U.S. Army Alaska, Directorate of Public Works
ATTN: IMPA-FWA-PWE (J. Malen)
1060 Gaffney Road #4500
Fort Wainwright, AK 99703-4500
(907) 353-4512
Joseph.malen@us.army.mil

Document Repositories:

Noel Wien Public Library
1215 Cowles Street
Fairbanks, Alaska 99701
(907) 459-1020

Fort Wainwright CERCLA Library
Building 3023
Fort Wainwright, AK 99703
(907) 353-4512

Fort Wainwright Post Library
3700 Santiago Avenue
Fort Wainwright, AK 99703
(907) 353-2642

Military Community

Fort Wainwright

Soldier readiness starts at home, on top-quality Army installations

Chief of Staff of the U.S. Army Gen. Mark A. Milley, left, recognized U.S. Army Garrison, Fort Wainwright, Alaska, as a bronze winner for installation excellence, during the 2016 Army Communities of Excellence Awards ceremony, May 24, in the Pentagon. Col. Sean C. Williams, garrison commander accepted the award. (Photo by Sgt. Ricky Bowden, U.S. Army)

C. Todd Lopez
Army Service News

A good foundation for Soldier and Army readiness, said the Army's chief of staff, is home base -- where Soldiers live, where their kids go to school, and where their spouses shop for groceries.

Thirteen Army installations were cited, May 24, for providing to Soldiers just that type of home base: one where they can leave home to conduct the nation's business, without being distracted by concerns for the well-being of the families they left behind.

During the 2016 Army Communities of Excellence Awards at the Pentagon, Gen. Mark A. Milley explained how installation excellence directly supports Soldier and Army readiness.

About 2.7 million Soldiers, he said, have deployed to Iraq and Afghanistan over the last 15 years. And for each one of those Soldiers, he said, "their first concern, actually, was not the Taliban or al Qaeda ... their first concern was always, in every case, their family."

The general said that today, some 60 percent of the force is married, and has, on average, between one and two children. Those Solders, he said, could not have performed their duties abroad if they were distracted with concerns for the well-being of their families back home.

"A Soldier who is deployed and who thinks his family doesn't have adequate housing, has mold in the showers, the roof is leaking, the heat or air conditioning doesn't work, who doesn't have adequate medical care for his family or children ... or a community that doesn't feel safe, or doesn't have adequate police protection ... is not going to focus on their job in training, and certainly not going to focus on their job in wartime."

It's the role of installation commanders, Milley said, to ensure that there are adequate medical facilities, schools in place that are well-equipped, well-stocked commissaries and post exchanges, family support programs, recreational centers, youth centers, child care facilities and fi - ness centers, for instance.

"The list goes on and on," he said. "These are huge responsibilities for these communities. It's incumbent upon all of us as part of the institution ... to really take care of that Soldier and importantly, their family. By doing so, we are contributing to the readiness of the force."

Readiness, Milley said, is today the Army's No. 1 priority.

"Those 2.7 million could not have performed their task in combat without knowing there was a rear detachment, without knowing there was a garrison commander, or hospital commander, or a school district their child was going to," he said.

Well-run installations, Milley said, provide for families. And that, he said, provides Soldiers with the confidence to do their combat mission. "It's really a direct and causal contributor to the readiness of our force."

For 2016, the Army recognized the following installations for providing Soldier families with the support needed so that Soldiers could confidently deploy in support of the nation:

PUBLIC NOTICE

U.S. Army Garrison Fort Wainwright, Alaska announces the Five-Year Review process of evaluating soil and groundwater remedies implemented at Operable Units 1 through 6 on Fort Wainwright, Alaska.

Section 121 (C) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan state "a remedial action that resulted in hazardous substances, pollutants, or contaminants remaining at the site shall be reviewed no less frequently than every five years." Thus, CERCLA requires a statutory Five-Year Review of the selected remedial actions at FWA.

USAG FWA initiated the Five-Year Review process in August 2015 and it will be completed by September 2016. The findings of the Five-Year Review will be available for public review after September 2016 at: Noel Wien Library in Fairbanks; Fort Wainwright Post Library; and Directorate of Public Works CERCLA Library, Building 3023, on Fort Wainwright. These three libraries contain detailed information concerning the selected remedies at Fort Wainwright and the soil and ground water contamination addressed by the remedies.

If you are interested in reviewing the document or if you have any questions regarding the Five-Year Review process, questions may be directed to:

Directorate of Public Works
ATTN: IMFW-PWE (J. Malen)
1046 Marks Rd
Fort Wainwright, AK 99703
(907) 361-4512 – *joseph.s.malen.civ@mail.mil*

ATTACHMENT 10

Groundwater Monitoring Data

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OU-1 801 Drum Burial Site

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OU-1 801 Drum Site Trend Analysis

Dieldrin groundwater concentrations (µg/L) were subjected to the Mann-Kendall test to determine if any surveillance well shows a statistically significant upward trend in concentration.

The Mann-Kendall test, described in the EPA document: Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities Unified Guidance (USEPA, March 2009) and USACE Engineer Manual: Environmental Quality – Environmental Statistics (USACE, May 2013), is an accepted method for identifying the presence of a significant upward trend at surveillance wells. Under this method it is assumed that no discernible linear trend exists in concentration data over time (null hypothesis). To test this hypothesis the Mann-Kendall statistic (test statistic) is determined. The test statistic is a function of the sample data which quantifies the probability associated with the relative magnitudes of the sample data for a given sample size (n). The significance of this probability is determined by comparison to the critical value, a threshold value of statistical significance. Under the normal approximation to the Mann-Kendall test, the critical value is determined based on a 95% level of confidence associated with the standard normal distribution. If the test statistic exceeds the critical value, the null hypothesis is rejected and the alternative hypothesis (concentrations are trending) accepted. For small sample sizes ($n \leq 10$) a slightly different procedure is utilized, in which the probability is calculated directly and compared to the selected level of significance (0.05 for a 95% level of confidence); in this case, the null hypothesis is rejected if the probability is less than the level of significance. Rejection of the null hypothesis is considered to be strong evidence of an upward trend; if the null hypothesis is not rejected there is insufficient evidence for identifying a significant, non-zero trend.

The results of the dieldrin groundwater concentration trend evaluation are presented in the following table. No trend was identified in wells 6327, 6326, 6331 and 7282.

WELL	SAMPLE SIZE (N)	TEST STATISTIC	CRITICAL VALUE
6327	12	0.07	1.64
6326	12	0.07	1.64
6331	12	-1.37	-1.64
7282	14	0.22	1.64

NOTE: If Test Statistic exceeds the Critical Value, there is evidence of trending.

Wells 6630, 7284 and 7279 were not evaluated as most of the data are censored (concentrations are predominantly non-detectable). The test loses significant statistical power if most of the data are censored.

Benzene groundwater concentrations were evaluated in wells 6327 and 6326, the results of which are presented in the table below. A downward trend was identified for well 6327, however concentrations remained constant between 2010 and 2015; a trend was not identified for well 6326, however the time series plot suggests a downward trend.

WELL	SAMPLE SIZE (N)	TEST PROBABILITY	LEVEL OF SIGNIFICANCE
6327	7	<0.0002	0.05
6326	6	0.068	0.05

NOTE: If the Test Probability is less than the Level of Significance, there is evidence of trending.

DRO groundwater concentrations were evaluated in well 6327, the results of which are presented in the table below. No trend was identified.

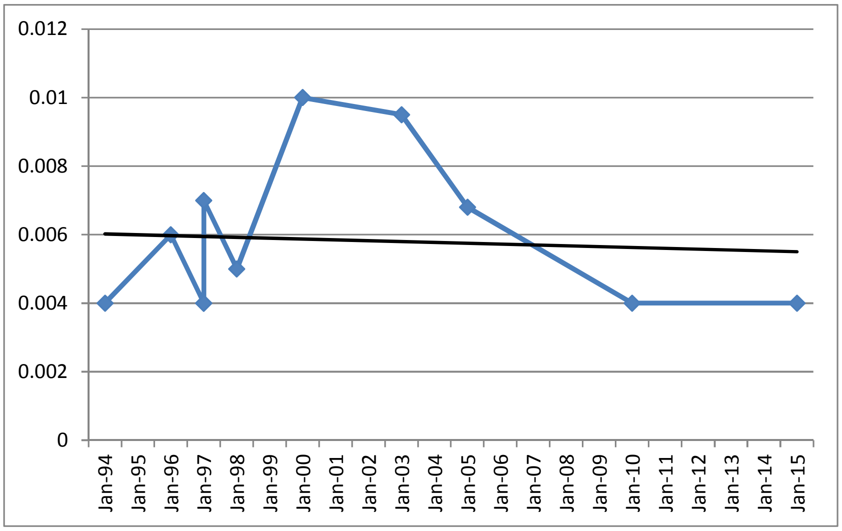
WELL	SAMPLE SIZE (N)	TEST PROBABILITY	LEVEL OF SIGNIFICANCE
6327	4	0.375	0.05

Cis-1,2-dichloroethene groundwater concentrations were evaluated in well 6326, the results of which are presented in the table below. A downward trend was identified.

WELL	SAMPLE SIZE (N)	TEST PROBABILITY	LEVEL OF SIGNIFICANCE
6326	6	0.028	0.05

Well AP-6327

Dieldrin	µg/L
Aug-93	0.66
Dec-94	0.004
Aug-96	0.006
Mar-97	0.004
Jun-97	0.004
Sep-97	0.007
Mar-98	0.005
Mar-00	0.01
Apr-03	0.0095
Apr-05	0.0068
Jul-10	0.004
May-15	0.004



Mann-Kendall Test Using Normal Approximation for Larger Samples

S	2					
V(S)	196.00	n	12	ties		
z	**0.07**			w_1 (0.004)	5	300
Z(0.9)	**1.28**	Z(0.95)	1.64			

Ho: No trend

Ha: upward Trend

Reject Ho if z> Z(0.9)

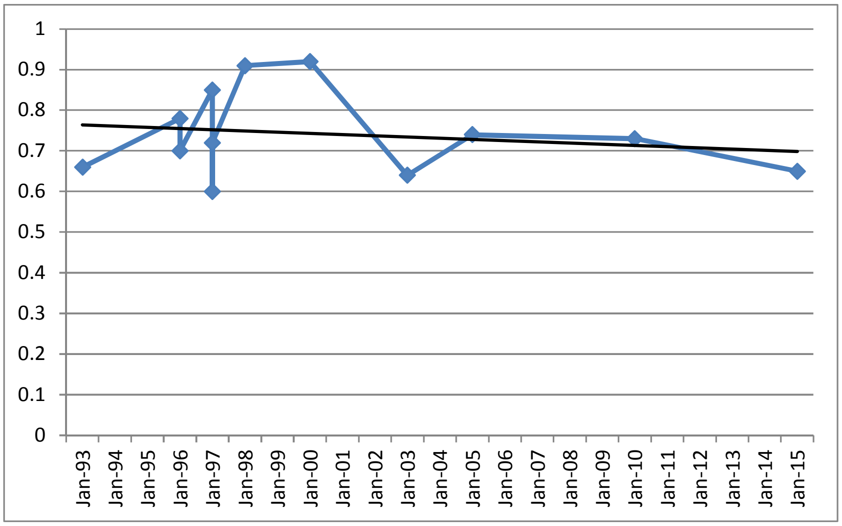
Ho is not rejected, there is no evidence of an upward trend at the 90% level of confidence

Reject Ho if z> Z(0.95)

Ho is not rejected, there is no evidence of an upward trend at the 95% level of confidence

Well AP-6326

Dieldrin	**µg/L**
Aug-93	0.66
Aug-96	0.78
Dec-96	0.7
Mar-97	0.85
Jun-97	0.6
Sep-97	0.72
Mar-98	0.91
Mar-00	0.92
Apr-03	0.64
Apr-05	0.74
Jul-10	0.73
May-15	0.65



Mann-Kendall Test Using Normal Approximation for Larger Samples

S	2		
V(S)	212.67	n	12
z	**0.07**		
Z(0.9)	**1.28**	Z(0.95)	1.64

Ho: No trend

Ha: upward Trend

Reject Ho if z> Z(0.9)

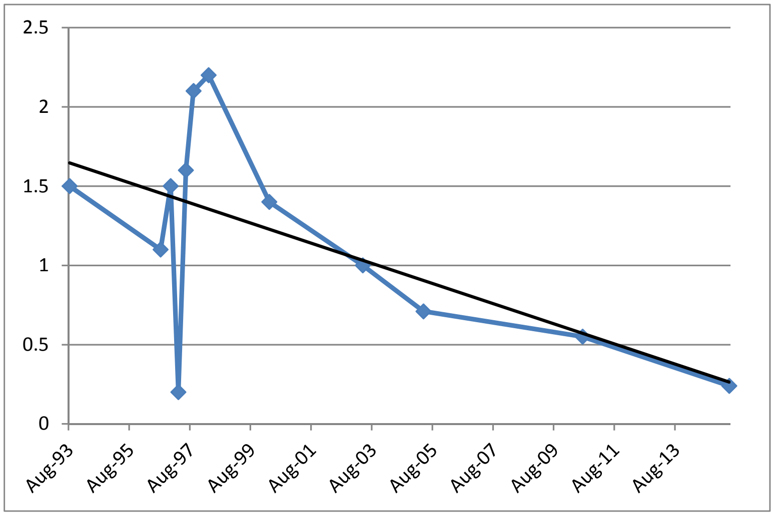
Ho is not rejected, there is no evidence of an upward trend at the 90% level of confidence

Reject Ho if z> Z(0.95)

Ho is not rejected, there is no evidence of an upward trend at the 95% level of confidence

Well AP-6331

Dieldrin	µg/L
Aug-93	1.5
Aug-96	1.1
Dec-96	1.5
Mar-97	0.2
Jun-97	1.6
Sep-97	2.1
Mar-98	2.2
Mar-00	1.4
Apr-03	1
Apr-05	0.71
Jul-10	0.55
May-15	0.24



Mann-Kendall Test Using Normal Approximation for Larger Samples

S	-21					
V(S)	211.67	n	12	ties		
z	**-1.37**			w_1 (1.5)	2	18
Z(0.9)	**-1.28**	Z(0.95)	**-1.64**			

Ho: No trend

Ha: downward Trend

Reject Ho if z< Z(0.9)

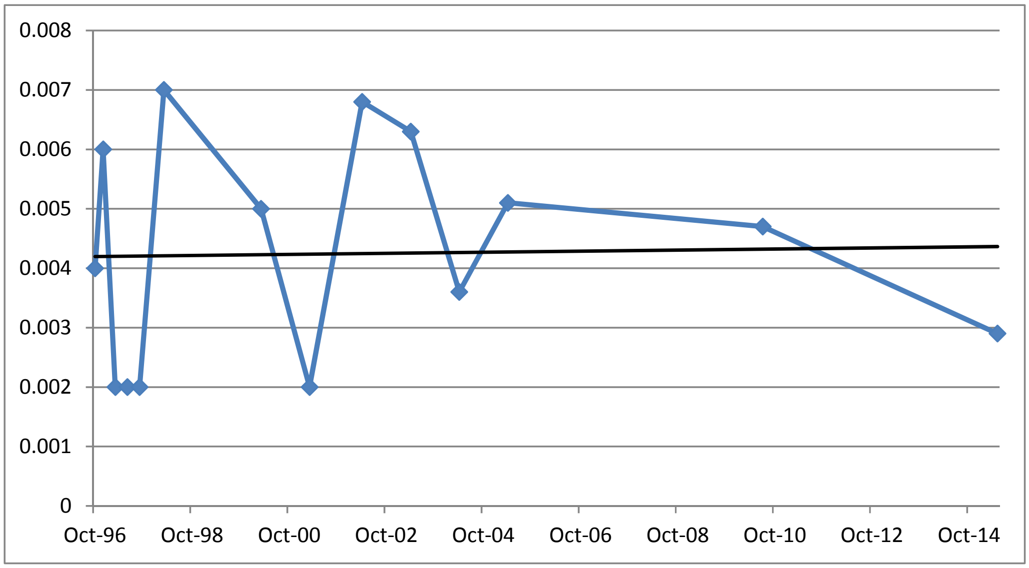
Ho is rejected, there is evidence of a downward trend at the 90% level of confidence

Reject Ho if z< Z(0.95)

Ho is not rejected, there is no evidence of a downward trend at the 95% level of confidence

Dieldrin	µg/L
Oct-96	0.004
Dec-96	0.006
Mar-97	0.002
Jun-97	0.002
Sep-97	0.002
Mar-98	0.007
Mar-00	0.005
Mar-01	0.002
Apr-02	0.0068
Apr-03	0.0063
Apr-04	0.0036
Apr-05	0.0051
Jul-10	0.0047
May-15	0.0029

Well AP-7282



Mann-Kendall Test Using Normal Approximation for Larger Samples

S	5					
V(S)	325.00	n	14	ties		
z	**0.22**			w_1 (0.002)	4	156
Z(0.9)	**1.28**	Z(0.95)	**1.64**			

Ho: No trend

Ha: Upward Trend

Reject Ho if z > Z(0.9)

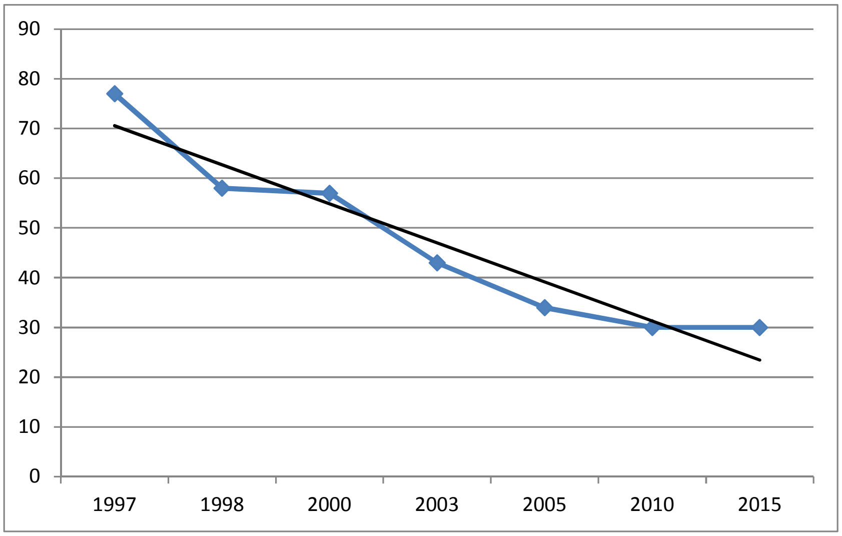
Ho is not rejected, there is no evidence of an upward trend at the 90% level of confidence

Reject Ho if z > Z(0.95)

Ho is not rejected, there is no evidence of an upward trend at the 95% level of confidence

Well AP-6327

Benzene	**µg/L**
1997	**77**
1998	**58**
2000	**57**
2003	**43**
2005	**34**
2010	**30**
2015	**30**



Mann-Kendall Trend Test for Small Sample Sizes (n≤10)

S	-20	
p	**<0.0002**	From Table B-10
n	7	

Ho: No trend

Ha: Downward Trend

Reject Ho if $p < 0.1$

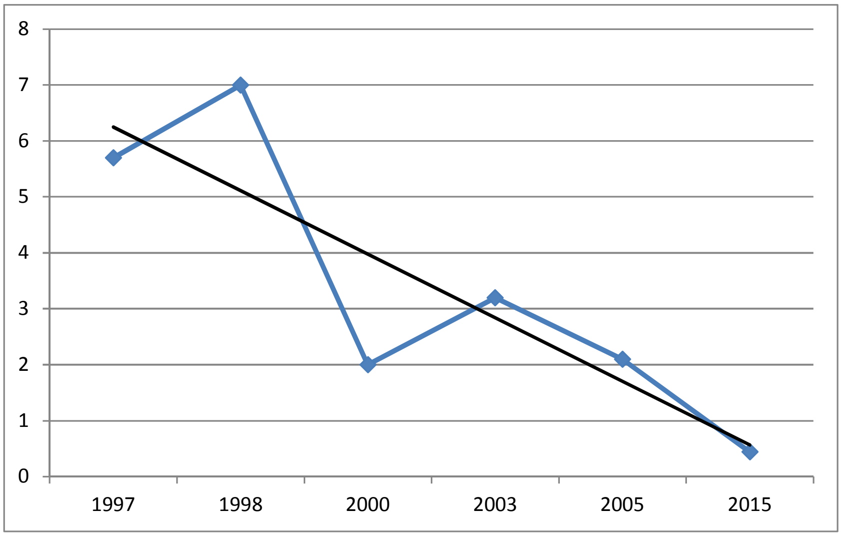
Ho is rejected, there is evidence of a downward trend at the 90% level of confidence

Reject Ho if $p < 0.05$

Ho is rejected, there is evidence of a downward trend at the 95% level of confidence

Well AP-6326

Benzene	**µg/L**
1997	**5.7**
1998	**7**
2000	2
2003	3.2
2005	2.1
2015	0.44



Mann-Kendall Trend Test for Small Sample Sizes (n≤10)

S	-9	
p	**0.068**	From Table B-10
n	6	

Ho: No trend

Ha: downward Trend

Reject Ho if $p < 0.1$

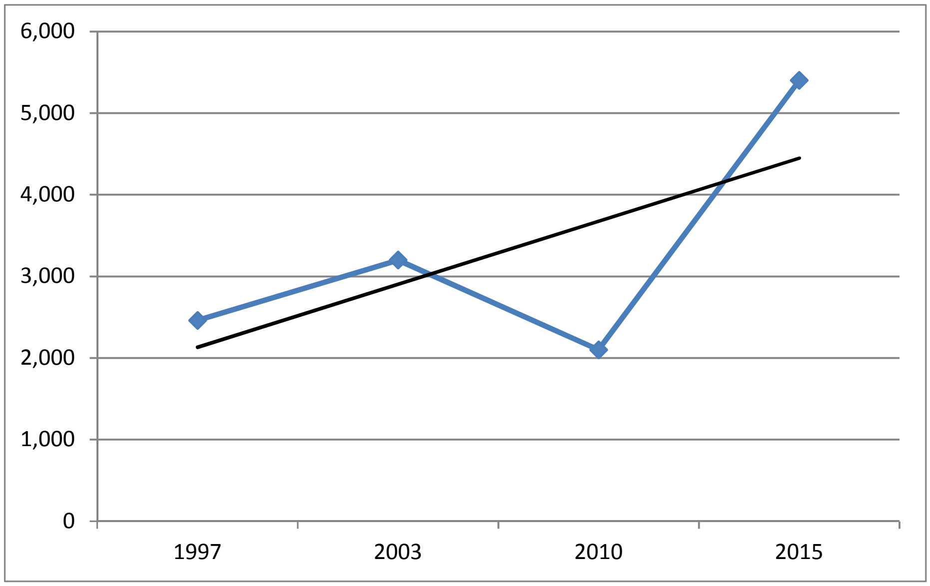
Ho is rejected, there is evidence of a downward trend at the 90% level of confidence

Reject Ho if $p < 0.05$

Ho is not rejected, there is no evidence of a downward trend at the 95% level of confidence

Well AP-6327

DRO	µg/L
1997	2,460
2003	3,200
2010	2,100
2015	5,400



Mann-Kendall Trend Test for Small Sample Sizes (n≤10)

S	2	
p	**0.375**	From Table B-10
n	4	

Ho: No trend

Ha: upward Trend

Reject Ho if $p < 0.1$

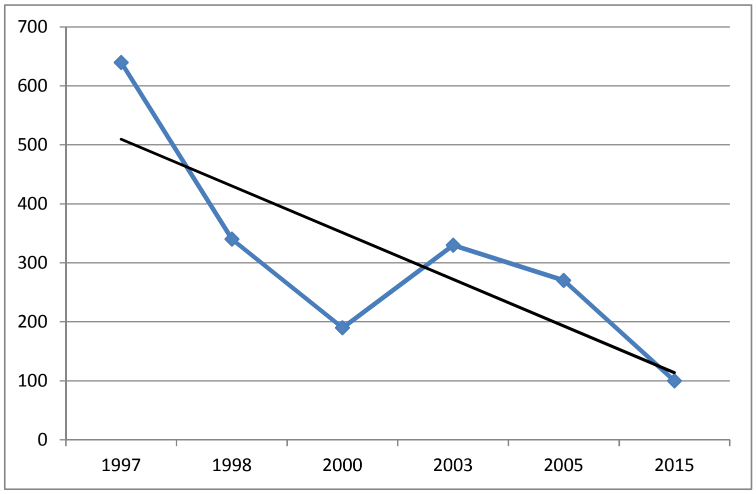
Ho is not rejected, there is no evidence of an upward trend at the 90% level of confidence

Reject Ho if $p < 0.05$

Ho is not rejected, there is no evidence of an upward trend at the 95% level of confidence

Well AP-6326

Cis-1,2-dichloroethene	**µg/L**
1997	640
1998	340
2000	190
2003	330
2005	270
2015	100



Mann-Kendall Trend Test for Small Sample Sizes (n≤10)

S	-11	
p	**0.028**	From Table B-10
n	6	

Ho: No trend

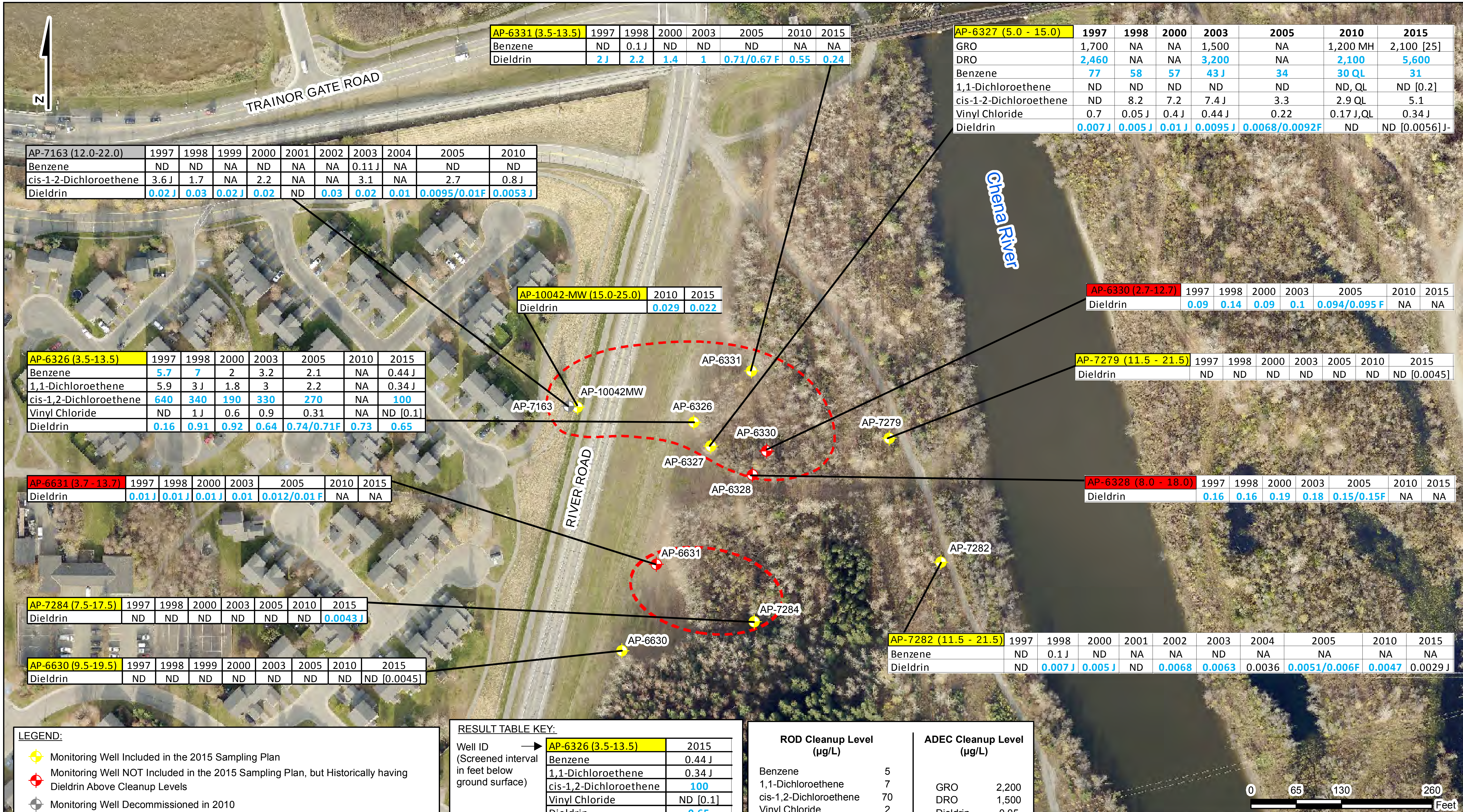
Ha: downward Trend

Reject Ho if p< 0.1

Ho is rejected, there is evidence of a downward trend at the 90% level of confidence

Reject Ho if p< 0.05

Ho is rejected, there is evidence of a downward trend at the 95% level of confidence



AP-6331 (3.5-13.5)	1997	1998	2000	2003	2005	2010	2015
Benzene	ND	0.1 J	ND	ND	ND	NA	NA
Dieldrin	2 J	2.2	1.4	1	0.71/0.67 F	0.55	0.24

AP-6327 (5.0 - 15.0)	1997	1998	2000	2003	2005	2010	2015
GRO	1,700	NA	NA	1,500	NA	1,200 MH	2,100 [25]
DRO	2,460	NA	NA	3,200	NA	2,100	5,600
Benzene	77	58	57	43 J	34	30 QL	31
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND, QL	ND [0.2]
cis-1-2-Dichloroethene	ND	8.2	7.2	7.4 J	3.3	2.9 QL	5.1
Vinyl Chloride	0.7	0.05 J	0.4 J	0.44 J	0.22	0.17 J,QL	0.34 J
Dieldrin	0.007 J	0.005 J	0.01 J	0.0095 J	0.0068/0.0092F	ND	ND [0.0056] J-

AP-7163 (12.0-22.0)	1997	1998	1999	2000	2001	2002	2003	2004	2005	2010
Benzene	ND	ND	NA	ND	NA	NA	0.11 J	NA	ND	ND
cis-1-2-Dichloroethene	3.6 J	1.7	NA	2.2	NA	NA	3.1	NA	2.7	0.8 J
Dieldrin	0.02 J	0.03	0.02 J	0.02	ND	0.03	0.02	0.01	0.0095/0.01F	0.0053 J

AP-10042-MW (15.0-25.0)	2010	2015
Dieldrin	0.029	0.022

AP-6330 (2.7-12.7)	1997	1998	2000	2003	2005	2010	2015
Dieldrin	0.09	0.14	0.09	0.1	0.094/0.095 F	NA	NA

AP-6326 (3.5-13.5)	1997	1998	2000	2003	2005	2010	2015
Benzene	5.7	7	2	3.2	2.1	NA	0.44 J
1,1-Dichloroethene	5.9	3 J	1.8	3	2.2	NA	0.34 J
cis-1,2-Dichloroethene	640	340	190	330	270	NA	100
Vinyl Chloride	ND	1 J	0.6	0.9	0.31	NA	ND [0.1]
Dieldrin	0.16	0.91	0.92	0.64	0.74/0.71F	0.73	0.65

AP-7279 (11.5 - 21.5)	1997	1998	2000	2003	2005	2010	2015
Dieldrin	ND	ND	ND	ND	ND	ND	ND [0.0045]

AP-6631 (3.7 -13.7)	1997	1998	2000	2003	2005	2010	2015
Dieldrin	0.01 J	0.01 J	0.01 J	0.01	0.012/0.01 F	NA	NA

AP-6328 (8.0 - 18.0)	1997	1998	2000	2003	2005	2010	2015
Dieldrin	0.16	0.16	0.19	0.18	0.15/0.15F	NA	NA

AP-7284 (7.5-17.5)	1997	1998	2000	2003	2005	2010	2015
Dieldrin	ND	ND	ND	ND	ND	ND	0.0043 J

AP-7282 (11.5 - 21.5)	1997	1998	2000	2001	2002	2003	2004	2005	2010	2015
Benzene	ND	0.1 J	ND	NA	NA	ND	NA	NA	NA	NA
Dieldrin	ND	0.007 J	0.005 J	ND	0.0068	0.0063	0.0036	0.0051/0.006F	0.0047	0.0029 J

AP-6630 (9.5-19.5)	1997	1998	1999	2000	2003	2005	2010	2015
Dieldrin	ND	ND	ND	ND	ND	ND	ND	ND [0.0045]

LEGEND:

- Monitoring Well Included in the 2015 Sampling Plan
- Monitoring Well NOT Included in the 2015 Sampling Plan, but Historically having Dieldrin Above Cleanup Levels
- Monitoring Well Decommissioned in 2010
- Dieldrin Plume

F = Filtered Sample Result
J = Estimated value
J- = Result qualified as estimate because it is less than the LOQ or due to QC failure
LOD = Limit of Detection
LOQ = Limit of Quantitation
NA = Not Analyzed
ND = Not Detected
MH = High Estimated Value
QL = Low Estimated Value

RESULT TABLE KEY:

Well ID

(Screened interval in feet below ground surface)

AP-6326 (3.5-13.5)	2015
Benzene	0.44 J
1,1-Dichloroethene	0.34 J
cis-1,2-Dichloroethene	100
Vinyl Chloride	ND [0.1]
Dieldrin	0.65

Analytical results shown in µg/L

Contaminant concentrations that exceed ROD and/or ADEC cleanup levels are shown in blue

LOD presented in brackets for ND results (LODs unknown prior to 2015)

Only concentrations for remedial action objective COCs are shown. Aldrin has been non-detect or below the cleanup level.

ROD Cleanup Level (µg/L)		ADEC Cleanup Level (µg/L)	
Benzene	5	GRO	2,200
1,1-Dichloroethene	7	DRO	1,500
cis-1,2-Dichloroethene	70	Dieldrin	0.05
Vinyl Chloride	2		
Dieldrin	0.004		

NOTES:

1. Coordinate System - Projection: World Geodetic System 1984 (WGS84) Universal Transverse Mercator (UTM), Zone 6N

2. Aerial imagery obtained from Department of Public Works (DPW) Environmental, 2014

Fairbanks Environmental Services
3538 International Street
Fairbanks, AK 99701

Alaska District
U.S. Army Corps of Engineers
Anchorage, AK

OU1 801 Drum Burial Site Monitoring Wells and Results
2015 Monitoring Report
Operable Unit 1
Fort Wainwright, Alaska

Contract: W911KB-12-D-0001 | Figure: 3-2 | Date: 2/16

OU-1 801 Drum Burial Site Groundwater Monitoring Data

Well	X Coordinate	Y Coordinate	Constituent	Sample Date	Result	Units	Detection Limit
AP-6327	1383268.691	3965431.576	Dieldrin	8/1/1993	0.66	ug/L	0.01
				12/1/1994	ND	ug/L	0.01
				8/1/1996	0.006	ug/L	0.01
				3/1/1997	ND	ug/L	0.02
				6/1/71997	ND	ug/L	0.02
				7/1/1997	0.007	ug/L	0.001
				9/1/1997	0.007	ug/L	0.01
				7/1/1998	0.005	ug/L	0.001
				3/1/1998	0.005	ug/L	0.01
				3/1/2000	0.01	ug/L	0.01
				7/1/2000	0.01	ug/L	0.001
				7/1/2003	0.0095	ug/L	0.001
				4/1/2003	0.0095	ug/L	0.01
				4/1/2005	0.0068	ug/L	0.01
				7/1/2005	0.0068	ug/L	0.001
				7/1/2010	ND	ug/L	0.001
				7/1/2010	ND	ug/L	0.0066
AP-6326	1383245.209	3965466.398	Dieldrin	8/1/1993	0.66	ug/L	0.01
				8/1/1996	0.78	ug/L	0.01
				12/1/1996	0.7	ug/L	0.01
				3/1/1997	0.85	ug/L	0.01
				6/1/1997	0.6	ug/L	0.01
				7/1/1997	0.16	ug/L	0.001
				9/1/1997	0.72	ug/L	0.01
				3/1/1998	0.91	ug/L	0.01
				7/1/1998	0.91	ug/L	0.001
				3/1/2000	0.92	ug/L	0.01
				7/1/2000	0.92	ug/L	0.001
				4/1/2003	0.64	ug/L	0.01
				7/1/2003	0.64	ug/L	0.001
				4/1/2005	0.74	ug/L	0.01
				7/1/2005	0.74	ug/L	0.001
				7/1/2010	0.73	ug/L	0.001
				7/1/2010	0.73	ug/L	0.01
AP-7163	1383078.698	3965490.762	Dieldrin	8/1/1996	0.02	ug/L	0.01
				12/1/1996	0.02	ug/L	0.01
				3/1/1997	ND	ug/L	0.02
				6/1/1997	ND	ug/L	0.02
				7/1/1997	0.02	ug/L	0.001
				9/1/1997	0.02	ug/L	0.01
				3/1/1998	0.02	ug/L	0.01
				7/1/1998	0.03	ug/L	0.001
				3/1/1999	0.02	ug/L	0.01
				7/1/1999	0.02	ug/L	0.001
				4/1/2000	0.021	ug/L	0.01
				7/1/2000	0.021	ug/L	0.001
				4/1/2001	ND	ug/L	0.01
				7/1/2001	0.004	ug/L	0.001
				4/1/2002	0.025	ug/L	0.01
				7/1/2002	0.025	ug/L	0.001
				4/1/2003	0.019	ug/L	0.01
				7/1/2003	0.019	ug/L	0.001
				4/1/2004	0.013	ug/L	0.01
				7/1/2004	0.013	ug/L	0.001
				4/1/2005	0.0095	ug/L	0.01
				7/1/2005	0.0095	ug/L	0.001
				7/1/2010	0.0053	ug/L	0.001
				7/1/2010	0.0053	ug/L	0.01

OU-1 801 Drum Burial Site Groundwater Monitoring Data

Well	X Coordinate	Y Coordinate	Constituent	Sample Date	Result	Units	Detection Limit
AP-6630	1383136.809	3965140.05	Dieldrin	12/1/1994	ND	ug/L	0.02
				8/1/1996	ND	ug/L	0.02
				12/1/1996	ND	ug/L	0.02
				3/1/1997	ND	ug/L	0.02
				6/1/1997	ND	ug/L	0.02
				7/1/1997	0.004	ug/L	0.001
				9/1/1997	ND	ug/L	0.02
				3/1/1998	ND	ug/L	0.02
				7/1/1998	0.004	ug/L	0.001
				3/1/1999	ND	ug/L	0.02
				7/1/1999	0.004	ug/L	0.001
				3/1/2000	0.004	ug/L	0.02
				7/1/2000	0.004	ug/L	0.001
				4/1/2003	ND	ug/L	0.02
				7/1/2003	0.004	ug/L	0.001
				7/1/2010	ND	ug/L	0.001
				7/1/2010	ND	ug/L	0.0024
AP-7284	1383327.239	3965178.978	Dieldrin	10/1/1996	0.008	ug/L	0.01
				12/1/1996	0.0007	ug/L	0.01
				9/1/1997	ND	ug/L	0.02
				7/1/1997	0.004	ug/L	0.001
				3/1/1998	ND	ug/L	0.02
				7/1/1998	0.004	ug/L	0.001
				3/1/2000	ND	ug/L	0.01
				7/1/2000	0.004	ug/L	0.001
				4/1/2003	ND	ug/L	0.01
				7/1/2003	0.004	ug/L	0.001
				4/1/2005	ND	ug/L	0.01
				7/1/2005	0.004	ug/L	0.001
				7/1/2010	ND	ug/L	0.001
				7/1/2010	ND	ug/L	0.00048
AP-6331	1383329.041	3965538.578	Dieldrin	8/1/1993	1.5	ug/L	0.01
				8/1/1996	1.1	ug/L	0.01
				12/1/1996	1.5	ug/L	0.01
				3/1/1997	ND	ug/L	0.02
				6/1/1997	1.6	ug/L	0.01
				7/1/1997	2	ug/L	0.001
				9/1/1997	2.1	ug/L	0.01
				3/1/1998	2.2	ug/L	0.01
				7/1/1998	2.2	ug/L	0.001
				3/1/2000	1.4	ug/L	0.01
				7/1/2000	1.4	ug/L	0.001
				4/1/2003	1	ug/L	0.01
				7/1/2003	1	ug/L	0.001
				4/1/2005	0.71	ug/L	0.01
				7/1/2005	0.71	ug/L	0.001
				7/1/2010	0.55	ug/L	0.001
				7/1/2010	0.55	ug/L	0.01

OU-1 801 Drum Burial Site Groundwater Monitoring Data

Well	X Coordinate	Y Coordinate	Constituent	Sample Date	Result	Units	Detection Limit
AP-7279	1383525.158	3965439.068	Dieldrin	10/1/1996	0.007	ug/L	0.01
				12/1/1996	ND	ug/L	0.02
				3/1/1997	ND	ug/L	0.02
				6/1/1997	ND	ug/L	0.02
				7/1/1997	0.004	ug/L	0.001
				9/1/1997	ND	ug/L	0.002
				3/1/1998	ND	ug/L	0.01
				7/1/1998	0.004	ug/L	0.001
				3/1/2000	ND	ug/L	0.01
				7/1/2000	0.004	ug/L	0.001
				4/1/2003	ND	ug/L	0.01
				7/1/2003	0.004	ug/L	0.001
				4/1/2005	ND	ug/L	0.01
				7/1/2005	0.004	ug/L	0.001
				7/1/2010	ND	ug/L	0.001
				7/1/2010	ND	ug/L	0.00025
AP-7282	1383596.247	3965260.085	Dieldrin	10/1/1996	0.004	ug/L	0.01
				12/1/1996	0.006	ug/L	0.01
				3/1/1997	ND	ug/L	0.02
				6/1/1997	ND	ug/L	0.02
				7/1/1997	0.004	ug/L	0.001
				9/1/1997	ND	ug/L	0.02
				3/1/1998	0.007	ug/L	0.001
				7/1/1998	0.007	ug/L	0.001
				3/1/2000	0.005	ug/L	0.001
				7/1/2000	0.005	ug/L	0.001
				3/1/2001	ND	ug/L	0.01
				7/1/2001	0.004	ug/L	0.001
				4/1/2002	0.0068	ug/L	0.01
				7/1/2002	0.0068	ug/L	0.001
				7/1/2003	0.0063	ug/L	0.001
				4/1/2003	0.0063	ug/L	0.01
				4/1/2004	0.0036	ug/L	0.01
				7/1/2004	0.0036	ug/L	0.001
				4/1/2005	0.0051	ug/L	0.01
				7/1/2005	0.0051	ug/L	0.001
				7/1/2010	0.0047	ug/L	0.001
				7/1/2010	0.0047	ug/L	0.01

Note: Dieldrin ROD clean-up level is 0.004 ug/L
ROD clean-up exceedences are highlighted
ND = Not detected above the detection limit

Table A-2 - Groundwater Sample Results
Operable Unit 1, 801 Drum Burial Site
Fort Wainwright, Alaska

				1	3	4	6	8	9	10	11	12	13	14	15
			Sample ID	15FWOU101WG	15FWOU102WG	15FWOU103WG	15FWOU104WG	15FWOU105WG	15FWOU106WG	15FWOU107WG	15FWOU108WG	15FWOU109WG	15FWOU110WG	15FWOU111WG	15FWOU112WQ
			Location ID	AP-6326	AP-6331	AP-6327	AP-1010	AP-7279	AP-7282	AP-6630	AP-7284	AP-10042MW	AP-2020	AP-6001	Trip Blank
			Sample Data Group	K1504900	K1504900	K1504900	K1504900	K1504900	K1504900	K1504900	K1504900	K1504900	K1504900	K1504900	K1504900
			Laboratory ID	150490001F	K150490002	150490003F	150490004F	K150490005	K150490006	K150490007	K150490008	K150490009	K150490010	K150490011	K150490012
			Collection Date	5/5/2015	5/5/2015	5/6/2015	5/6/2015	5/6/2015	5/7/2015	5/7/2015	5/7/2015	5/7/2015	5/7/2015	5/7/2015	5/5/2015
			Matirx	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
			Sample Type	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary	Primary	Primary	Field Duplicate	PE Sample	Trip Blank
Analyte	Method	Units	Cleanup Level[1]	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result[[LOD] Qualifier	Result[[LOD] Qualifier
Gasoline Range Organics (C6-C10)	AK101	µg/L	2,200	-	-	2100 [25]	2000 [25]	-	-	-	-	-	-	-	ND [25]
Diesel Range Organics (C10-C25)	AK102	µg/L	1,500	-	-	**5400 [20] J-**	**5600 [20]**	-	-	-	-	-	-	-	-
Sulfate	E300.0	mg/L	NE	13.5 [0.2]	-	0.17 [0.04] J	0.24 [0.04] J	-	-	-	-	-	-	-	-
Iron	SW6010C	µg/L	NE	30.6 [10]	-	69500 [10]	68100 [10]	-	-	-	-	-	-	-	-
Manganese	SW6010C	µg/L	NE	22.1 [1]	-	6260 [1]	6080 [1]	-	-	-	-	-	-	-	-
4,4'-DDD	SW8081B	µg/L	3.5	ND [0.0046]	ND [0.0045]	ND [0.0046]	-	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0046]	-
4,4'-DDE	SW8081B	µg/L	2.5	ND [0.0021]	ND [0.002]	ND [0.0069]	-	ND [0.002]	ND [0.002]	0.0005 [0.002] J	ND [0.002]	ND [0.002]	ND [0.002]	0.0022 [0.0021] J	-
4,4'-DDT	SW8081B	µg/L	2.5	ND [0.024]	ND [0.0072]	ND [0.015]	-	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.0022]	ND [0.0017]	ND [0.0015]	0.0013 [0.0011] J	-
Aldrin	SW8081B	µg/L	0.05 (0.004)	ND [0.0021]	ND [0.002]	ND [0.0041]	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	0.55 [0.021]	-
alpha-BHC	SW8081B	µg/L	0.14	ND [0.0021]	ND [0.002]	ND [0.0044] J-	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.0021]	-
alpha-Chlordane	SW8081B	µg/L	2	ND [0.0021]	ND [0.002]	ND [0.021] J-	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.0021]	-
beta-BHC	SW8081B	µg/L	0.47	ND [0.0046]	ND [0.0045]	ND [0.0046] J-	-	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0046]	-
Chlordane	SW8081B	µg/L	2	ND [0.21]	ND [0.2]	ND [0.21]	-	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.21]	-
Chlorpyrifos	SW8081B	µg/L	NE	ND [0.0021]	ND [0.002]	ND [0.015]	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.0021]	-
cis-Nonachlor	SW8081B	µg/L	NE	ND [0.0021]	ND [0.002]	ND [0.0021]	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.0021]	-
delta-BHC	SW8081B	µg/L	NE	ND [0.0046]	ND [0.0045]	ND [0.0046] J-	-	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0046]	-
Dieldrin	SW8081B	µg/L	0.053 (0.004)	0.65 [0.023]	0.24 [0.0045]	ND [0.0056] J-	-	ND [0.0045]	0.0029 [0.0045] J	ND [0.0045]	0.0043 [0.0045] J	0.021 [0.0045]	0.022 [0.0045]	1.5 [0.046]	-
Endosulfan I	SW8081B	µg/L	220	ND [0.0021]	ND [0.002]	ND [0.0021] J-	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.0021]	-
Endosulfan II	SW8081B	µg/L	220	0.001 [0.0021] J	0.0021 [0.002] J	ND [0.025] J-	-	0.0023 [0.002] J	0.0024 [0.002] J	0.0024 [0.002] J	0.0047 [0.002] J	0.0083 [0.002] J	0.0094 [0.002] J	ND [0.0021]	-
Endosulfan sulfate	SW8081B	µg/L	NE	ND [0.0021]	ND [0.002]	ND [0.014] J-	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.0023]	ND [0.0021]	-
Endrin	SW8081B	µg/L	2	0.0074 [0.0021] J	0.0071 [0.002] J	ND [0.0027] J-	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	1.5 [0.021]	-
Endrin aldehyde	SW8081B	µg/L	NE	ND [0.0046]	ND [0.0045]	0.0079 [0.0046] J-	-	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	0.0016 [0.0046] J	-
Endrin ketone	SW8081B	µg/L	NE	0.0059 [0.0021] J-	0.0073 [0.002] J-	ND [0.0021] J-	-	ND [0.002] J-	ND [0.002] J-	ND [0.002] J-	ND [0.002] J-	ND [0.002] J-	ND [0.002] J-	0.01 [0.0021] J-	-
gamma-BHC (Lindane)	SW8081B	µg/L	0.2	ND [0.0021]	ND [0.002]	ND [0.0043]	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	2.4 [0.021]	-
gamma-Chlordane	SW8081B	µg/L	2	ND [0.0046]	ND [0.0045]	ND [0.0063] J-	-	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	ND [0.0045]	0.0019 [0.0046] J	-
Heptachlor	SW8081B	µg/L	0.4	ND [0.0011]	ND [0.001]	ND [0.0073]	-	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	0.79 [0.011]	-
Heptachlor epoxide	SW8081B	µg/L	0.2	ND [0.0021]	ND [0.002]	ND [0.0025] J-	-	0.0005 [0.002] J	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	1.2 [0.021]	-
Hexachlorobenzene	SW8081B	µg/L	1	ND [0.0021]	ND [0.002]	ND [0.0021]	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	3.1 [0.021]	-
Hexachlorobutadiene	SW8081B	µg/L	7.3	ND [0.013]	ND [0.013]	ND [0.013]	-	ND [0.013]	ND [0.013]	ND [0.013]	ND [0.013]	ND [0.013]	ND [0.013]	0.008 [0.013] J	-
Hexachloroethane	SW8081B	µg/L	40	ND [0.013]	ND [0.013]	ND [0.013]	-	ND [0.013]	ND [0.013]	ND [0.013]	ND [0.013]	ND [0.013]	ND [0.013]	ND [0.013]	-
Isodrin	SW8081B	µg/L	NE	ND [0.0021]	ND [0.002]	ND [0.0021]	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	0.0075 [0.0021] J	-
Methoxychlor	SW8081B	µg/L	40	ND [0.0021]	ND [0.002]	ND [0.0021] J-	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	2.8 [0.021]	-
Mirex	SW8081B	µg/L	NE	ND [0.0021]	ND [0.002]	ND [0.005]	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.0021]	-
Oxychlordane	SW8081B	µg/L	NE	ND [0.0021]	ND [0.002]	ND [0.0048]	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.0036]	-
Toxaphene	SW8081B	µg/L	3	ND [0.41]	ND [0.4]	ND [0.83] J	-	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.41]	-
trans-Nonachlor	SW8081B	µg/L	NE	ND [0.0021]	ND [0.002]	ND [0.0021] J-	-	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.0021]	-
1,1,1,2-Tetrachloroethane	SW8260C	µg/L	NE	ND [0.2]	-	ND [2] J-	ND [2]	-	-	-	-	-	-	-	ND [0.2]
1,1,1-Trichloroethane	SW8260C	µg/L	200	ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
1,1,2,2-Tetrachloroethane	SW8260C	µg/L	4.3	ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
1,1,2-Trichloroethane	SW8260C	µg/L	5	ND [0.4]	-	ND [4] J-	ND [4]	-	-	-	-	-	-	-	ND [0.4]
1,1-Dichloroethane	SW8260C	µg/L	7,300	ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
1,1-Dichloroethene	SW8260C	µg/L	7 (7)	0.34 [0.2] J	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
1,1-Dichloropropene	SW8260C	µg/L	NE	ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
1,2,3-Trichlorobenzene	SW8260C	µg/L	NE	ND [0.4]	-	ND [0.4]	ND [0.4]	-	-	-	-	-	-	-	ND [0.4]
1,2,3-Trichloropropane	SW8260C	µg/L	0.12	ND [0.5]	-	ND [0.5]	ND [0.5]	-	-	-	-	-	-	-	ND [0.5]
1,2,4-Trichlorobenzene	SW8260C	µg/L	70	ND [0.3]	-	ND [0.3]	ND [0.3]	-	-	-	-	-	-	-	ND [0.3]
1,2,4-Trimethylbenzene	SW8260C	µg/L	1,850	ND [0.2]	-	180 [2]	170 [2]	-	-	-	-	-	-	-	0.09 [0.2] J
1,2-Dibromo-3-chloropropane	SW8260C	µg/L	NE	ND [0.8]	-	ND [0.8]	ND [0.8]	-	-	-	-	-	-	-	ND [0.8]
1,2-Dibromoethane	SW8260C	µg/L	0.05	ND [0.2]	-	ND [2] J-	ND [2]	-	-	-	-	-	-	-	ND [0.2]
1,2-Dichlorobenzene	SW8260C	µg/L	600	ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
1,2-Dichloroethane	SW8260C	µg/L	5	ND [0.15]	-	ND [0.15]	ND [0.15]	-	-	-	-	-	-	-	ND [0.15]
1,2-Dichloropropane	SW8260C	µg/L	5	ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
1,3,5-Trimethylbenzene	SW8260C	µg/L	1,800	ND [0.2]	-	62 [0.2]	62 [0.2]	-	-	-	-	-	-	-	ND [0.2]
1,3-Dichlorobenzene	SW8260C	µg/L	3,300	ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
1,3-Dichloropropane	SW8260C	µg/L	8.5	ND [0.3]	-	ND [3] J-	ND [3]	-	-	-	-	-	-	-	ND [0.3]

Table A-2 - Groundwater Sample Results
Operable Unit 1, 801 Drum Burial Site
Fort Wainwright, Alaska

				1	3	4	6	8	9	10	11	12	13	14	15
			Sample ID	15FWOU101WG	15FWOU102WG	15FWOU103WG	15FWOU104WG	15FWOU105WG	15FWOU106WG	15FWOU107WG	15FWOU108WG	15FWOU109WG	15FWOU110WG	15FWOU111WG	15FWOU112WQ
			Location ID	AP-6326	AP-6331	AP-6327	AP-1010	AP-7279	AP-7282	AP-6630	AP-7284	AP-10042MW	AP-2020	AP-6001	Trip Blank
			Sample Data Group	K1504900	K1504900	K1504900	K1504900	K1504900	K1504900	K1504900	K1504900	K1504900	K1504900	K1504900	K1504900
			Laboratory ID	150490001F	K150490002	150490003F	150490004F	K150490005	K150490006	K150490007	K150490008	K150490009	K150490010	K150490011	K150490012
			Collection Date	5/5/2015	5/5/2015	5/6/2015	5/6/2015	5/6/2015	5/7/2015	5/7/2015	5/7/2015	5/7/2015	5/7/2015	5/7/2015	5/5/2015
			Matirx	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
			Sample Type	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary	Primary	Primary	Field Duplicate	PE Sample	Trip Blank
Analyte	Method	Units	Cleanup Level[1]	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result[[LOD] Qualifier	Result[[LOD] Qualifier
1,4-Dichlorobenzene	SW8260C	µg/L	75	ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
2,2-Dichloropropane	SW8260C	µg/L	NE	ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
2-Butanone	SW8260C	µg/L	22,000	ND [4]	-	ND [4]	ND [4]	-	-	-	-	-	-	-	ND [4]
2-Chlorotoluene	SW8260C	µg/L	NE	ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
2-Hexanone	SW8260C	µg/L	NE	ND [10]	-	ND [100]	ND [100]	-	-	-	-	-	-	-	ND [10]
4-Chlorotoluene	SW8260C	µg/L	NE	ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
4-Isopropyltoluene	SW8260C	µg/L	NE	ND [0.2]	-	9.7 [0.2]	9.6 [0.2]	-	-	-	-	-	-	-	ND [0.2]
4-Methyl-2-pentanone	SW8260C	µg/L	2,900	ND [10]	-	ND [10]	ND [10]	-	-	-	-	-	-	-	ND [10]
Acetone	SW8260C	µg/L	33,000	ND [10]	-	ND [10]	ND [10]	-	-	-	-	-	-	-	ND [10]
Benzene	SW8260C	µg/L	5 (5)	0.44 [0.1] J	-	30 [0.1]	31 [0.1]	-	-	-	-	-	-	-	ND [0.1]
Bromobenzene	SW8260C	µg/L	NE	ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
Bromochloromethane	SW8260C	µg/L	NE	ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
Bromodichloromethane	SW8260C	µg/L	14	ND [0.3]	-	ND [0.3]	ND [0.3]	-	-	-	-	-	-	-	ND [0.3]
Bromoform	SW8260C	µg/L	110	ND [0.5]	-	ND [5] J-	ND [5]	-	-	-	-	-	-	-	ND [0.5]
Bromomethane	SW8260C	µg/L	51	ND [0.3]	-	ND [0.3]	ND [0.3]	-	-	-	-	-	-	-	ND [0.3]
Carbon disulfide	SW8260C	µg/L	3,700	ND [0.2]	-	0.08 [0.2] J	0.09 [0.2] J	-	-	-	-	-	-	-	ND [0.2]
Carbon tetrachloride	SW8260C	µg/L	5	ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
Chlorobenzene	SW8260C	µg/L	100	ND [0.2]	-	ND [2] J-	ND [2]	-	-	-	-	-	-	-	ND [0.2]
Chloroethane	SW8260C	µg/L	290	ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
Chloroform	SW8260C	µg/L	140	ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
Chloromethane	SW8260C	µg/L	66	ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
cis-1,2-Dichloroethene	SW8260C	µg/L	70	**100 [1]**	-	4.9 [0.2]	5.1 [0.2]	-	-	-	-	-	-	-	ND [0.2]
cis-1,3-Dichloropropene	SW8260C	µg/L	8.50	ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
Dibromochloromethane	SW8260C	µg/L	10	ND [0.5]	-	ND [5] J-	ND [5]	-	-	-	-	-	-	-	ND [0.5]
Dibromomethane	SW8260C	µg/L	370	ND [0.5]	-	ND [0.5]	ND [0.5]	-	-	-	-	-	-	-	ND [0.5]
Dichlorodifluoromethane	SW8260C	µg/L	7,300	ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
Ethylbenzene	SW8260C	µg/L	700	ND [0.1]	-	12 [1]	12 [1]	-	-	-	-	-	-	-	ND [0.1]
Hexachlorobutadiene	SW8260C	µg/L	7.3	ND [0.3]	-	ND [0.3]	ND [0.3]	-	-	-	-	-	-	-	ND [0.3]
Isopropylbenzene	SW8260C	µg/L	3,700	ND [0.2]	-	6.6 [2] J-	6.4 [2]	-	-	-	-	-	-	-	ND [0.2]
Methylene chloride	SW8260C	µg/L	5	ND [0.2]	-	ND [0.2]	ND [0.73]	-	-	-	-	-	-	-	ND [0.2]
Methyl-tert-butyl ether (MTBE)	SW8260C	µg/L	470	ND [0.3]	-	ND [0.3]	ND [0.3]	-	-	-	-	-	-	-	ND [0.3]
Naphthalene	SW8260C	µg/L	730	ND [0.3]	-	17 [0.3]	16 [0.3]	-	-	-	-	-	-	-	0.09 [0.3] J
n-Butylbenzene	SW8260C	µg/L	370	ND [0.1]	-	ND [5.8]	ND [5.8]	-	-	-	-	-	-	-	ND [0.1]
n-Propylbenzene	SW8260C	µg/L	370	ND [0.2]	-	8.9 [0.2]	8.9 [0.2]	-	-	-	-	-	-	-	ND [0.2]
o-Xylene	SW8260C	µg/L	10,000	ND [0.2]	-	17 [2]	17 [2]	-	-	-	-	-	-	-	ND [0.2]
sec-Butylbenzene	SW8260C	µg/L	370	ND [0.1]	-	3.9 [0.1]	3.9 [0.1]	-	-	-	-	-	-	-	ND [0.1]
Styrene	SW8260C	µg/L	100	ND [0.2]	-	ND [2] J-	ND [2]	-	-	-	-	-	-	-	ND [0.2]
tert-Butylbenzene	SW8260C	µg/L	370	ND [0.2]	-	0.61 [0.2] J	0.58 [0.2] J	-	-	-	-	-	-	-	ND [0.2]
Tetrachloroethene (PCE)	SW8260C	µg/L	5	ND [0.2]	-	ND [2]	ND [2]	-	-	-	-	-	-	-	ND [0.2]
Toluene	SW8260C	µg/L	1,000	0.14 [0.1] J	-	3.9 [0.1]	4.1 [0.1]	-	-	-	-	-	-	-	ND [0.1]
trans-1,2-Dichloroethene	SW8260C	µg/L	100	1.8 [0.2]	-	0.15 [0.2] J	0.14 [0.2] J	-	-	-	-	-	-	-	ND [0.2]
trans-1,3-Dichloropropene	SW8260C	µg/L	8.50	ND [0.2]	-	ND [2] J-	ND [2]	-	-	-	-	-	-	-	ND [0.2]
Trichloroethene (TCE)	SW8260C	µg/L	5	0.23 [0.1] J	-	ND [0.1]	ND [0.1]	-	-	-	-	-	-	-	ND [0.1]
Trichlorofluoromethane	SW8260C	µg/L	11,000	ND [0.2]	-	ND [0.2]	ND [0.2]	-	-	-	-	-	-	-	ND [0.2]
Vinyl chloride	SW8260C	µg/L	2 (2)	ND [0.1]	-	0.32 [0.1] J	0.34 [0.1] J	-	-	-	-	-	-	-	ND [0.1]
Xylene, Isomers m & p	SW8260C	µg/L	10,000	ND [0.2]	-	54 [2]	53 [2]	-	-	-	-	-	-	-	ND [0.2]

The ADEC cleanup level is the most stringent soil cleanup level from 18 AAC 75.341 (below 40 inches). The ROD Cleanup levels for the five OU1 contaminants of concern are shown in parentheses.

Table 3-1 Survey Data and Groundwater Elevations
2015 Monitoring Report, 801 Drum Burial Site, OU1
Fort Wainwright, Alaska

WELL ID	Northing[1] (UTM, Zone 6, meters)	Easting[1] (UTM, Zone 6, meters)	Top PVC Elevation[2] (feet MSL) 2004	Top PVC Elevation[3] (feet MSL) 2010	PVC Elevation Differences (feet)[4]	Screened Interval (feet BTOC)	Measured Depth to Water[5] (feet BTOC)	Measured Depth to Bottom[5] (feet BTOC)	Water Elevation (feet MSL)
AP-6326	7190972.23	469066.53	445.26	445.23	0.03	3.5' - 13.5' [6]	11.95	17.16	433.28
AP-6327	7190961.73	469073.85	443.19	443.16	0.04	5.0' - 15.0' [6]	9.81	18.50	433.35
AP-6328	7190949.26	469092.08	447.1	NM	NA	8.0' - 18.0' [6]	NM	NM	NM
AP-6330	7190959.59	469098.29	440.05	NM	NA	2.7' - 12.7' [6]	NM	NM	NM
AP-6331	7190994.62	469091.72	445.29	445.28	0.01	3.5' - 13.5' [6]	11.99	16.97	433.29
AP-6629	7190883.95	469184.64	451.7	NM	NA	11.5' - 21.5'	NM	NM	NM
AP-6630	7190872.28	469035.08	447.98	447.97	0.01	9.5' - 19.5'	14.57	22.90	433.40
AP-6631	7190910.10	469050.06	443.65	NM	NA	3.7' - 13.7'	NM	NM	NM
AP-7162	7191066.59	469037.83	463.02	NM	NA	22' - 32'	NM	NM	NM
AP-10042MW	7190978.85	469015.69	NA	452.16	NA	15' - 25'	18.88	24.75	433.28
AP-7279	7190965.25	469151.95	451.24	451.21	0.03	11.5' - 21.5'	17.87	24.93	433.34
AP-7280	7190990.86	469141.43	451.13	NM	NA	12.5' - 22.5'	NM	NM	NM
AP-7281	7190934.50	469164.89	451.24	NM	NA	12.5' - 22.5'	NM	NM	NM
AP-7282	7190911.06	469174.47	450.65	450.64	0.01	11.5' - 21.5'	17.18	24.94	433.46
AP-7283	7190869.65	469140.66	451.09	NM	NA	17.5' - 27.5'	NM	NM	NM
AP-7284	7190885.06	469092.91	439.99	440.00	-0.01	7.5' - 17.5'	6.57	19.70	433.43

BTOC Below Top of Casing
MSL Mean Sea Level
PVC Polyvinyl Chloride
NA Not Applicable
NM Not Measured

Well Notes:
1) Horizontal survey conducted in 2009 and data retrieved from the Fort Wainwright Monitoring Well Database (AP-10042MW was surveyed in 2010).
2) Elevation survey data conducted in 2004 (ENSR, 2006).
3) Elevation survey conducted by Windy Creek Surveys of Fairbanks, Alaska, in August 2010.
4) Difference in PVC casing elevations between 2004 and 2010.
5) Water level measurements conducted by FES in May 2015.
6) No well construction diagrams available; assumed based on well soundings and boring logs.

LEGEND:

AP-6630 433.40 — Monitoring Well, Groundwater Elevations in Feet Mean Sea Level (MSL)

433.40 — Groundwater Table Contour - May 2015 C.I. = 0.2 Ft.

Inferred Groundwater Flow Direction

Fort Wainwright Post Boundary

NOTE:

1. Coordinate System - Projection: World Geodetic System 1984 (WGS84) Universal Transverse Mercator (UTM), Zone 6N.

SOURCES:

1. Aerial imagery obtained from Department of Public Works (DPW) Environmental, 2014.

2. Groundwater Contours were created with Surver v.9.

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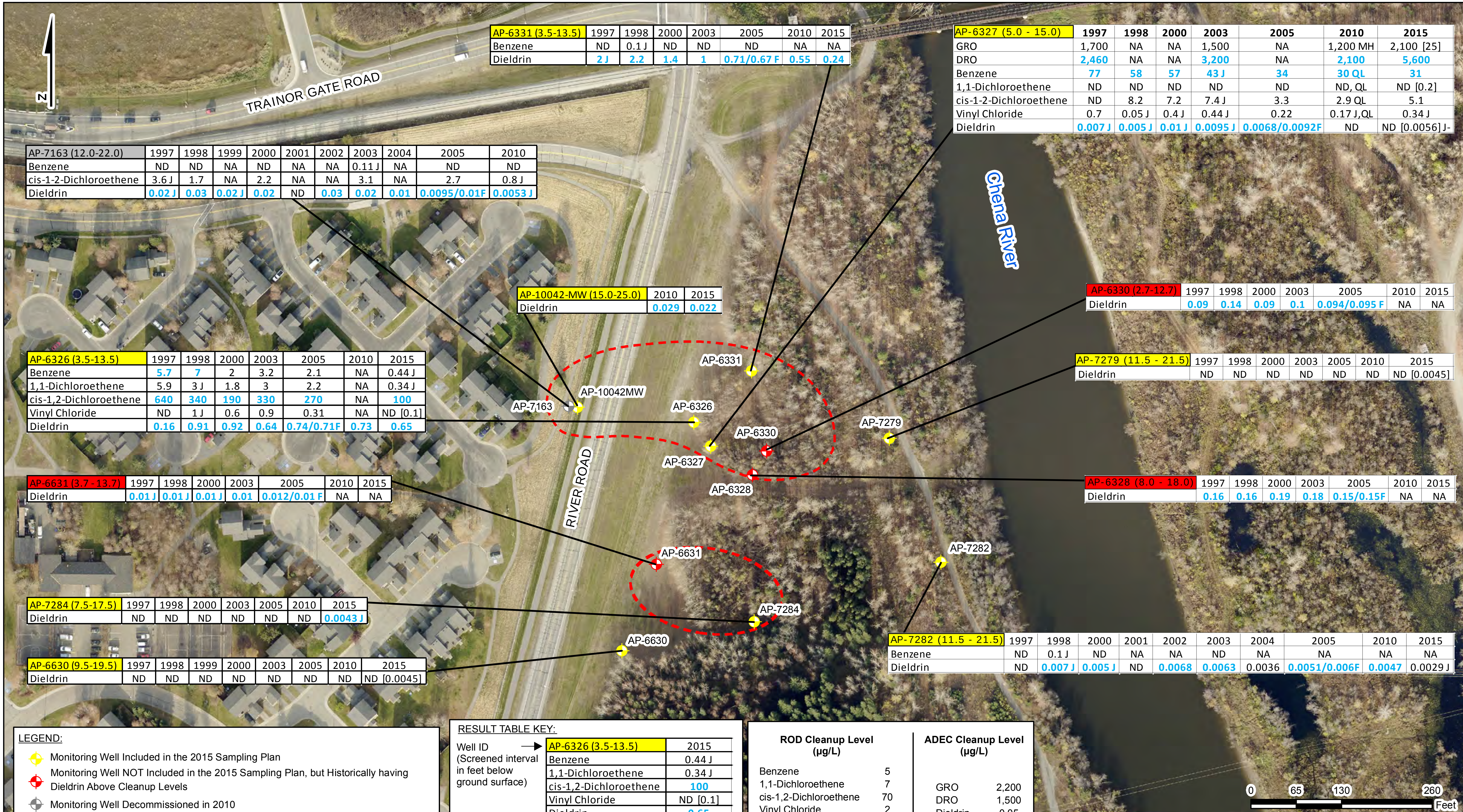
Alaska District
U.S. Army Corps of Engineers
Anchorage, AK

Groundwater Elevation Contours (May 2015)
2015 Monitoring Report
Operable Unit 1
Fort Wainwright, Alaska

Contract: W911KB-12-D-0001	Figure: 3-1	Date: 7/16



AP-6331 (3.5-13.5)	1997	1998	2000	2003	2005	2010	2015
Benzene	ND	0.1 J	ND	ND	ND	NA	NA
Dieldrin	2 J	2.2	1.4	1	0.71/0.67 F	0.55	0.24

AP-6327 (5.0 - 15.0)	1997	1998	2000	2003	2005	2010	2015
GRO	1,700	NA	NA	1,500	NA	1,200 MH	2,100 [25]
DRO	2,460	NA	NA	3,200	NA	2,100	5,600
Benzene	77	58	57	43 J	34	30 QL	31
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND, QL	ND [0.2]
cis-1-2-Dichloroethene	ND	8.2	7.2	7.4 J	3.3	2.9 QL	5.1
Vinyl Chloride	0.7	0.05 J	0.4 J	0.44 J	0.22	0.17 J,QL	0.34 J
Dieldrin	0.007 J	0.005 J	0.01 J	0.0095 J	0.0068/0.0092F	ND	ND [0.0056] J-

AP-7163 (12.0-22.0)	1997	1998	1999	2000	2001	2002	2003	2004	2005	2010
Benzene	ND	ND	NA	ND	NA	NA	0.11 J	NA	ND	ND
cis-1-2-Dichloroethene	3.6 J	1.7	NA	2.2	NA	NA	3.1	NA	2.7	0.8 J
Dieldrin	0.02 J	0.03	0.02 J	0.02	ND	0.03	0.02	0.01	0.0095/0.01F	0.0053 J

AP-10042-MW (15.0-25.0)	2010	2015
Dieldrin	0.029	0.022

AP-6330 (2.7-12.7)	1997	1998	2000	2003	2005	2010	2015
Dieldrin	0.09	0.14	0.09	0.1	0.094/0.095 F	NA	NA

AP-6326 (3.5-13.5)	1997	1998	2000	2003	2005	2010	2015
Benzene	5.7	7	2	3.2	2.1	NA	0.44 J
1,1-Dichloroethene	5.9	3 J	1.8	3	2.2	NA	0.34 J
cis-1,2-Dichloroethene	640	340	190	330	270	NA	100
Vinyl Chloride	ND	1 J	0.6	0.9	0.31	NA	ND [0.1]
Dieldrin	0.16	0.91	0.92	0.64	0.74/0.71F	0.73	0.65

AP-7279 (11.5 - 21.5)	1997	1998	2000	2003	2005	2010	2015
Dieldrin	ND	ND	ND	ND	ND	ND	ND [0.0045]

AP-6631 (3.7 -13.7)	1997	1998	2000	2003	2005	2010	2015
Dieldrin	0.01 J	0.01 J	0.01 J	0.01	0.012/0.01 F	NA	NA

AP-6328 (8.0 - 18.0)	1997	1998	2000	2003	2005	2010	2015
Dieldrin	0.16	0.16	0.19	0.18	0.15/0.15F	NA	NA

AP-7284 (7.5-17.5)	1997	1998	2000	2003	2005	2010	2015
Dieldrin	ND	ND	ND	ND	ND	ND	0.0043 J

AP-7282 (11.5 - 21.5)	1997	1998	2000	2001	2002	2003	2004	2005	2010	2015
Benzene	ND	0.1 J	ND	NA	NA	ND	NA	NA	NA	NA
Dieldrin	ND	0.007 J	0.005 J	ND	0.0068	0.0063	0.0036	0.0051/0.006F	0.0047	0.0029 J

AP-6630 (9.5-19.5)	1997	1998	1999	2000	2003	2005	2010	2015
Dieldrin	ND	ND	ND	ND	ND	ND	ND	ND [0.0045]

LEGEND:

- Monitoring Well Included in the 2015 Sampling Plan
- Monitoring Well NOT Included in the 2015 Sampling Plan, but Historically having Dieldrin Above Cleanup Levels
- Monitoring Well Decommissioned in 2010
- Dieldrin Plume

F = Filtered Sample Result
J = Estimated value
J- = Result qualified as estimate because it is less than the LOQ or due to QC failure
LOD = Limit of Detection
LOQ = Limit of Quantitation
NA = Not Analyzed
ND = Not Detected
MH = High Estimated Value
QL = Low Estimated Value

RESULT TABLE KEY:

Well ID
(Screened interval in feet below ground surface)

AP-6326 (3.5-13.5)	2015
Benzene	0.44 J
1,1-Dichloroethene	0.34 J
cis-1,2-Dichloroethene	100
Vinyl Chloride	ND [0.1]
Dieldrin	0.65

Analytical results shown in µg/L

Contaminant concentrations that exceed ROD and/or ADEC cleanup levels are shown in blue

LOD presented in brackets for ND results (LODs unknown prior to 2015)

Only concentrations for remedial action objective COCs are shown. Aldrin has been non-detect or below the cleanup level.

ROD Cleanup Level (µg/L)	
Benzene	5
1,1-Dichloroethene	7
cis-1,2-Dichloroethene	70
Vinyl Chloride	2
Dieldrin	0.004

ADEC Cleanup Level (µg/L)	
GRO	2,200
DRO	1,500
Dieldrin	0.05

NOTES:

1. Coordinate System - Projection: World Geodetic System 1984 (WGS84) Universal Transverse Mercator (UTM), Zone 6N

2. Aerial imagery obtained from Department of Public Works (DPW) Environmental, 2014

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Alaska District
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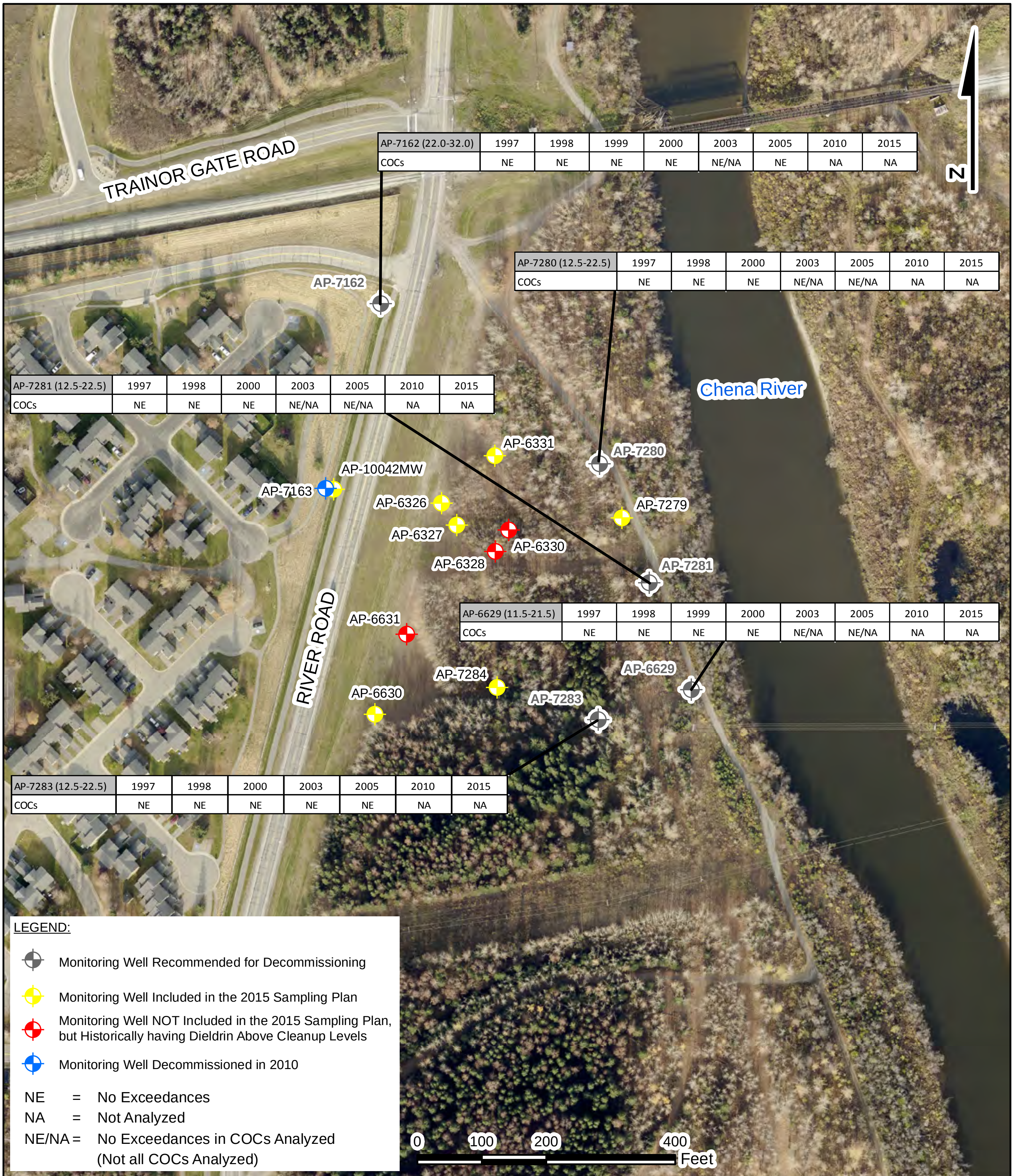
Anchorage, AK

OU1 801 Drum Burial Site Monitoring Wells and Results
2015 Monitoring Report
Operable Unit 1
Fort Wainwright, Alaska

Contract: W911KB-12-D-0001 | Figure: 3-2 | Date: 7/16



AP-7162 (22.0-32.0)	1997	1998	1999	2000	2003	2005	2010	2015
COCs	NE	NE	NE	NE	NE/NA	NE	NA	NA

AP-7280 (12.5-22.5)	1997	1998	2000	2003	2005	2010	2015
COCs	NE	NE	NE	NE/NA	NE/NA	NA	NA

AP-7281 (12.5-22.5)	1997	1998	2000	2003	2005	2010	2015
COCs	NE	NE	NE	NE/NA	NE/NA	NA	NA

AP-6629 (11.5-21.5)	1997	1998	1999	2000	2003	2005	2010	2015
COCs	NE	NE	NE	NE	NE/NA	NE/NA	NA	NA

AP-7283 (12.5-22.5)	1997	1998	2000	2003	2005	2010	2015
COCs	NE	NE	NE	NE	NE	NA	NA

NOTES:

1. Screened interval in feet below ground surface is shown in parenthesis next to well ID number in each call out box.

2. Coordinate System - Projection: World Geodetic System 1984 (WGS84) Universal Transverse Mercator (UTM), Zone 6N

3. Aerial imagery obtained from Department of Public Works (DPW) Environmental, 2014

SOURCE:

1. AEC Third Five-Year Review Report, September 2011

Fairbanks Environmental Services
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Alaska District
U.S. Army Corps of Engineers
Anchorage, AK

OU1 Monitoring Wells Recommended for Decommissioning
2015 Monitoring Report
Operable Unit 1
Fort Wainwright, Alaska

Contract: W911KB-12-D-0001 | Figure: 4-1 | Date: 7/16

OU-2 Building 1168 Leach Well

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NOTES:

1. HORIZONTAL DATUM: UTM ZONE 6N, WGS 1984, METERS
2. AERIAL IMAGERY FROM FORT WAINWRIGHT, 2012

LEGEND

MONITORING WELL SAMPLED IN 2015

FAIRBANKS ENVIRONMENTAL SERVICES
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FAIRBANKS, AK 99701

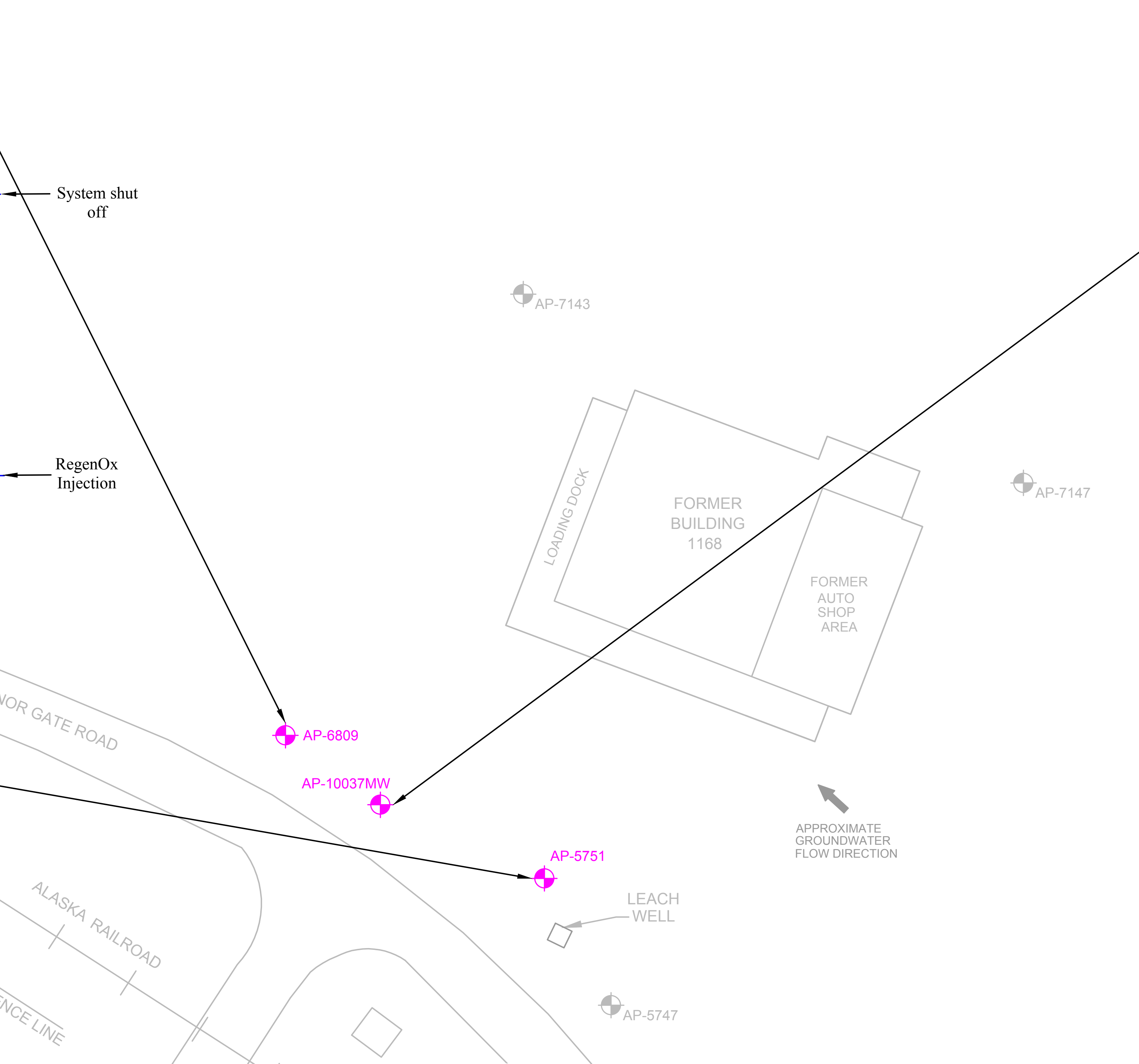
ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Former Building 1168 Groundwater Sampling Locations
2014 Monitoring Report
Operable Unit 2
Fort Wainwright, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-12-D-0001	2-2	5/15

AP-6809
(27, 9-22)

	DRO	RRO	GRO	TCE	BENZENE	WATER ELEVATIONS
JUN 98	1,920	NA	431	3.36	9.96	426.28
SEP 98	1,160	NA	857	1.8	5.11	428.23
DEC 98	818	NA	236	1.6	2.64	425.66
System shut off						
MAR 99	658	NA	227	1.53	1.85	426.27
MAY 00	2,290	NA	225	1.2	6.5	426.70
SEP 00	1,680	NA	ND (250)	ND (1)	3.58	429.74
MAY 01	1,250	NA	NA	1.37	4.48	426.59
SEP 01	869	NA	NA	1.2	4.01	427.87
JUL 02	1,150	NA	NA	1.2	4.25	—
SEP 02	850	NA	NA	ND (2)	1.9	—
SEP 03	1,240	NA	NA	ND (1)	1.74	430.39
SEP 04	1,480	NA	NA	0.850	4.28	426.58
OCT 05	2,450	NA	NA	0.75	3.76	428.03
MAY 06	2,160	NA	NA	0.78	3.28	426.26
SEP 06	1,500	NA	NA	0.68	1.2	427.32
MAY 07	2,100	240	110	0.81	2.6	426.67
SEPT 07	730	78	21	0.37	0.30	427.54
JUNE 08	1,600	180	78	0.54	2.0	427.18
OCT 08	310	110	ND (50)	0.22	0.30	427.24
MAY 09	700	120	51	0.10	0.95	428.07
JUNE 10	1,000	340	66	0.54	1.3	426.51
SEPT 10	1,300	280	34	0.28	0.68	426.88
RegenOx Injection						
NOV 10	870	150	21	0.25	0.49	NM
JAN 11	1,400	200	39	0.32	1.0	425.76
JUNE 11	2,100	290	72	0.29	0.73	427.61
AUG 11	1,300	170	53	0.24	0.69	427.82
SEPT 11	1,600	260	41	0.22	0.81	428.56
AUG 12	1,200	110	36	0.12	0.55	427.00
MAY 13	1,630	479	55.5	ND (0.62)	0.63	425.92
OCT 14	ND(318)	232	ND(50)	ND (0.5)	ND(0.2)	428.98
MAY 15	567	NA	71.7	ND (0.5)	0.48	427.53



AP-10037MW
(25, 12-22)

	DRO	RRO	GRO	TCE	BENZENE	WATER ELEVATIONS
NOV 94	11,000	NA	7,000	310	140	
DEC 94	15,000	NA	12,000	ND (10)	140	
APR 95	18,000	NA	16,000	39	83	
JUL 95	4,400	NA	7,300	19	31	
OCT 95	4,300	NA	7,100	34	40	
FEB 96	8,100	NA	15,000	76	110	
APR 96	15,000	NA	13,000	ND (1)	86	
JUL 96	5,660	NA	9,350	NA	NA	
OCT 96	3,600	NA	3,200	NA	64	
JAN 97	4,500	NA	4,800	33	36	
MAY 97	2,200	NA	1,200	3.0	68	
AUG 97	3,200	NA	1,000	9.0	71	
OCT 97	2,000	NA	1,800	8.0	46	
SEP 98	317	NA	ND (40)	ND (1)	ND (1)	
DEC 98	335	NA	ND (40)	ND (1)	ND (1)	
System shut off						
MAR 99	409	NA	ND (90)	ND (1)	ND (1)	
MAY 00	882	NA	ND (90)	ND (1)	1.31	
SEP 00	476	NA	ND (250)	ND (1)	1.88	
MAY 01	670	NA	NA	ND (1)	4.44	
SEP 01	1,020	NA	NA	ND (1)	8.53	
JUN 02	460	NA	NA	ND (1)	6.8	
SEP 02	480	NA	NA	ND (1)	4.0	
SEP 03	919	NA	NA	ND (1)	1.08	
SEP 04	1,590	NA	NA	0.81 J	23.7	
JAN 05	2,390	NA	184	NA	13.8	
OCT 05	2,340	NA	NA	ND (1)	7.67	
MAY 06	2,430	NA	NA	1.69	14.4	
SEP 06	2,500	NA	NA	1.30	12	
MAY 07	1,600	210	340	0.84	7.7	
SEPT 07	1,400	100	260	0.53	10	
JUNE 08	1,600	170	230	0.39	5.7	
OCT 08	2,500	220	480	0.77	15	
MAY 09	910	170	180	0.12	6.1	
JUNE 10	1,300	180	430	0.86	15	
JULY 10	1,200	140	260	ND (0.5)	1.4	
SEPT 10	1,600	320	160	ND (0.5)	0.91	427.05
RegenOx Injection						
NOV 10	810	190	55	0.13	0.47	NM
JAN 11	640	210	61	0.15	0.3	426.23
JUNE 11	1,500	380	73	0.33	0.42	427.80
AUG 11	1,100	250	67	0.30	0.59	428.08
SEPT 11	1,300	440	75	0.21	0.53	428.75
AUG 12	1,100	120	110	ND (0.1)	1.30	427.15
MAY 13	1,760	774	129	ND (0.62)	1.76	426.08
OCT 14	990	637	33.7	ND (0.5)	ND(0.2)	429.13
MAY 15	677	NA	135	ND (0.5)	2.78	427.82

Water elevation data for PS-23 is not available because well was not surveyed. Replacement well AP-10037 was surveyed in 2010.

AP-5751
(20, 7-17)

	DRO	RRO	GRO	TCE	BENZENE	WATER ELEVATIONS
AUG 94	34,000	NA	18,000	23	ND (2)	427.77
SEP 04	15,100	NA	NA	ND (1)	0.23	426.68
JAN 05	18,000	4,840	1,070	ND (1)	0.90	426.55
OCT 05	5,140 Q	NA	NA	ND (1)	ND (0.4)	428.22
MAY 06	13,000	NA	NA	ND (1)	ND (0.4)	426.38
SEP 06	3,500	NA	NA	ND (1)	ND (1)	427.46
MAY 07	15,000	1,200	770	0.43	0.57	426.82
SEPT 07	3,100	380	120	ND (1)	ND (1)	427.76
JUNE 08	12,000	980	610	0.49	0.46	427.37
OCT 08	1,600	430	100	0.10	0.19	427.38
MAY 09	3,800	490	220	ND (1)	ND (1)	428.23
JAN 11	7,400	640	410	0.49	0.4	426.19
JUNE 11	3,300	810	370	0.49	0.28	427.78
AUG 11	2,900	520	120	0.11	0.08	428.03
SEPT 11	2,600	660	130	ND (0.50)	0.07	428.71
AUG 12	1,300	270	110	ND (0.10)	0.09	427.13
MAY 13	4,520	850	350	ND (0.10)	0.41	426.06
OCT 14	1,210	786	ND(50)	ND (0.5)	ND(0.2)	429.12
MAY 15	968	NA	76.4	ND (0.5)	ND(0.2)	427.55

CLEANUP LEVELS (µg/L)

5.0	BENZENE
1,500	DRO
2,200	GRO
1,100	RRO
5.0	TCE

0 25 50 100
SCALE IN FEET

NOTES:

1. TRAINOR GATE ROAD NEAR FORMER BUILDING 1168 WAS REPAVED IN THE FALL OF 2006. AP-5747 WAS WITHIN THE ALTERED ROAD AND CONVERTED INTO A FLUSH MOUNT. THE WELL WAS CONVERTED POST SAMPLING EVENT IN SEPTEMBER 2006.
2. ADEC CLEANUP LEVEL FOR GRO CHANGED FROM 1,300 mg/L TO 2,200 mg/L IN OCTOBER 2008.
3. AP-7143 AND AP-7147 ARE ASSOCIATED WITH THE 2-PARTY SITE AND HAVE NOT BEEN SAMPLED SINCE 2007.
4. AP-5790 IS ASSOCIATED WITH THE 3-PARTY SITE AND HAS NOT BEEN SAMPLED SINCE 2008
5. PS-23 WAS REPLACED BY AP-10037MW IN JULY 2010.
6. REGENESIS REGENOX AND ORC-A INJECTION COMPLETED NEAR AP-10037MW IN OCTOBER 2010.

LEGEND

AP-5751	MONITORING WELL LOCATION AND NUMBER
AP-5747	MONITORING WELL NOT SAMPLED
bgs	BELOW GROUND SURFACE
DRO	DIESEL RANGE ORGANICS
GRO	GASOLINE RANGE ORGANICS
NA	ANALYSIS NOT PERFORMED
ND	NOT DETECTED (REPORTING LIMITS)
NGVD29	NATIONAL GEODETIC VERTICAL DATUM OF 1929
NM	NOT MEASURED
RRO	RESIDUAL RANGE ORGANICS
TCE	TRICHLOROETHENE
TOC	TOP OF CASING
—	DATA NOT FOUND

KEY:

SAMPLING POINT
TOTAL DEPTH, (TOC) SCREENED INTERVAL (bgs)
CONTAMINANTS OF CONCERN

AP–5751 (20, 7-17)	DRO	GRO	TCE	BENZENE	WATER ELEVATIONS
AUG 94	34,000	18,000	23	ND (2)	427.77
SEP 04	15,100	NA	ND (1)	0.23	426.68
JAN 05	19,300	1,080	NA	0.9	426.55
OCT 05	5,140	NA	ND (1)	ND (0.4)	428.22

SAMPLE MONTH
CONCENTRATIONS EXCEEDING CLEANUP LEVELS
CONCENTRATIONS IN MICROGRAMS PER LITER (µg/L)
ELEVATIONS IN FEET (NGVD29)
SEE LEGEND FOR ABBREVIATIONS.

FAIRBANKS ENVIRONMENTAL SERVICES
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Former Building 1168 Groundwater Monitoring Results

2015 Monitoring Report
Operable Unit 2
Fort Wainwright, Alaska

CONTRACT: W911KB-12-D-0001
FIGURE: 5-1
DATE: 1/16

FIGURE 5-1

Table 5-5 - 2010 - 2015 Groundwater Sample Results
Former Building 1168

Well Number	Relative Location	Sample Number	Date	Water Elevation (feet NGVD29)	ORP (mV)	Dissolved Oxygen (mg/L)	pH	Conductivity (mS/cm)	Dissolved Iron (mg/L)	Sulfate (mg/L)	Gasoline Range Organics (µg/L)	Diesel Range Organics (µg/L)	Residual Range Organics (µg/L)	ROD Chemicals of Concern (µg/L) Benzene	Trichloro-ethene (TCE)	Tetrachloro-ethene (PCE)	Vinyl Chloride	1,1-Dichloro-ethene	cis-1,2- Dichloro-ethene	trans-1,2-Dichloro-ethene
ROD CLEANUP LEVELS (3-Party Site)									**2,200[1]**	**1,500[1]**	**1,100[1]**			**5**	**5**	**5**	**2**	**7**	**70**	**70**
		11FW2H05WG	1/27/2011	426.19	-42.6	0.5	6.20	0.622	NA	NA	410	**7,400**	640	0.4 J	0.49 J	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
		11FW2H09WG-A	6/1/2011	427.78	66.3	0.7	6.07	0.347	5.79	7.49	370	**3,300 ML**	810	0.28 J	0.49 J	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
		11FW2H09WG-B[3]							0.03	22.4	120	**3,000**	560 J	0.07 J	ND(0.5)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
		11FW2H08WG-B	8/12/2011	428.03	50.6	2.5	6.22	0.59	0.04	22.3	120	**2,900**	520 J	0.08 J	0.11 J	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
		11FW2H14WG	9/21/2011	428.71	6.9	2.5	6.16	0.576	0.70 J	27.1	130	**2,600**	660 QH	0.07 J	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
		12FW2H02WG	8/22/2012	427.13	101.9	3.6	6.34	0.481	0.51	11.7	110	1,300	270 J,Q	0.09 J	ND(0.10)	ND(0.20)	ND(0.10)	ND(0.20)	ND(0.20)	ND(0.20)
		13FW2H01WG	5/2/2013	426.06	-24.2	0.3	6.07	0.502	5.95	13.5	350 B	**4,520**	850	0.41	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU204WG	10/9/2014	429.12	169	0.6	6.25	0.913	ND(0.25)	33.8	ND(50)	1,210	786	ND(0.2)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
AP-5751	Upgradient	15FWOU204WG	05/12/2015	427.55	87.2	0.4	5.78	0.588	0.27	29.7	76.4 J	968 J	NA	ND(0.2)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
PS-23		10FW2H02WG	6/2/2010	NA	-87.2	0.8	6.55	0.802	30.70	22.7	430	1,300 QL	180 J	**15**	0.86	ND(0.5)	ND(0.5)	ND(0.5)	0.27 J	ND(0.5)
		10FW2H03WG[3]							NA	NA	420	1,300 QL	190 J	**15**	0.85	ND(0.5)	ND(0.5)	ND(0.5)	0.26 J	ND(0.5)
		10FW2H05WG	7/28/2010	NM	NM	NM	NM	NM	12.40	24.9	260	1,200	140 J,B	1.4	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	0.080 J	ND(0.5)
		10FW2H07WG	9/28/2010	427.05	24.4	0.8	6.43	0.933	NA	NA	160	**1,600**	320 J,B	0.9	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
		10FW2H09WG	11/15/2010	NM	178.6	12.9[2]	8.07	2.590	0.62	295	55 J	810 J,QL	190 J,Q	0.5 J	0.13 J	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
		11FW2H01WG	1/24/2011	426.23	-100.0	1.0	6.88	3.275	3.90	366	61 J	640 J	210 J	0.3 J	0.15 J	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
		11FW2H06WG-A	6/1/2011	427.80	-62.3	0.7	6.97	2.178	5.63	128	73 J	**1,500**	380 J	0.4 J	0.33 J	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
		11FW2H07WG-A[3]								128	77 J	**1,500**	420 J	0.4 J	0.34 J	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
		11FW2H07WG-B	8/12/2011	428.08	5.5	1.0	7.03	1.981	6.18	122	67 J	1,100	250 J	0.6	0.30 J	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
		11FW2H12WG	9/21/2011	428.75	-93.3	2.3	7.06	2.12	7.09 J	144	75 J	1,300	440 J,QH	0.5	0.21 J	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
		11FW2H13WG[3]							6.86 J,QL	143	75 J	1,100	380 J,QH	0.5	0.23 J	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
		12FW2H03WG	8/22/2012	427.15	-40.6	4.0	7.17	2.179	8.21 QL	63.0	110	860	73 J,Q	1.3	ND(0.10)	ND(0.20)	ND(0.10)	ND(0.20)	ND(0.20)	ND(0.20)
		12FW2H04WG[3]							8.27 QL	63.1	110	1,110	120 J,Q	1.3	ND(0.10)	ND(0.20)	ND(0.10)	ND(0.20)	ND(0.20)	ND(0.20)
		13FW2H02WG	5/2/2013	426.08	-107.6	0.3	6.85	1.686	8 QL	38.9	126 B	**1,760**	774 Q	1.6	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		13FW2H03WG[3]							7.77	48.7	129 B	**1,550**	527 Q	1.8	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU201WG	10/9/2014	429.13	209.5	0.7	7.2	3.758	ND(0.25) J-,J	185.0	32.5 J,B	773	490 J	ND(0.2)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(500)
		14FWOU202WG							0.15 J-, J	188.0	33.7 J	990	637	ND(0.2)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
		15FWOU202WG	05/12/2015	427.82	24.7	0.3	6.31	1.138	8.3	34.2	135	667	NA	2.75	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(500)
AP-10037MW	Source Area	15FWOU203WG							8.37	34.1	133	610 J	NA	2.78	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
		10FW2H04WG	6/2/2010	426.51	-10.3	1.3	6.34	0.970	NA	NA	66 J	1,000 QL	340 J	1.3	0.54	ND(0.5)	ND(0.5)	ND(0.5)	0.18 J	ND(0.5)
		10FW2H06WG	9/28/2010	426.88	144.8	0.8	6.08	1.017	NA	NA	34 J	1,300	280 J,B	0.7	0.28 J	ND(0.5)	ND(0.5)	ND(0.5)	0.08 J	ND(0.5)
		10FW2H10WG	11/15/2010	NM	170.6	0.7	6.50	1.172	NA	NA	21 J	870 ML,QL	150 J,B,Q	0.5 J	0.25 J	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
		11FW2H02WG	1/24/2011	426.06	77.8	0.4	6.32	1.004	NA	NA	39 J	1,400	200 J	1.0	0.32 J	ND(0.50)	ND(0.50)	ND(0.50)	0.11 J	ND(0.50)
		11FW2H03WG[3]							NA	NA	39 J	1,400	190 J	0.9	0.31 J	ND(0.50)	ND(0.50)	ND(0.50)	0.09 J	ND(0.50)
		11FW2H08WG-A	6/1/2011	427.61	143.2	0.8	6.24	0.756	5.54	35.3	72 J	**2,100**	290 J	0.7	0.29 J	ND(0.50)	ND(0.50)	ND(0.50)	0.11 J	ND(0.50)
		11FW2H06WG-B	8/12/2011	427.82	61.1	1.3	6.17	0.766	1.68	40.5	53 J	1,300	170 J,B	0.7	0.24 J	ND(0.50)	ND(0.50)	ND(0.50)	0.11 J	ND(0.50)
		11FW2H11WG	9/21/2011	428.56	8.3	2.3	6.26	0.774	1.39 J	53.6	41 J,B	**1,600 ML**	260 J,B,QH	0.8	0.22 J	ND(0.50)	ND(0.50)	ND(0.50)	0.08 J	ND(0.50)
		12FW2H01WG	8/22/2012	427.00	80.2	1.4	6.45	1.017	3.19	61.4	36 J	1,200 ML	110 J,Q	0.6	0.12J	ND(0.20)	ND(0.10)	ND(0.20)	ND(0.20)	ND(0.20)
		13FW2H04WG	5/2/2013	425.92	41.3	0.3	6.33	1.005	0.96 J	80.3	56 J,B	**1,630**	479 J	0.6	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU203WG	10/9/2014	428.98	181.4	1.0	6.36	1.254	ND(0.25)	102	ND(50)	ND(318)	0.232 J	ND(0.2)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
AP-6809	Downgradient	15FWOU201WG	05/12/2015	427.53	94.9	0.4	5.98	1.099	1.3	72	71.7 J	567 J	NA	0.48	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)

Notes:

Analytes exceeding remedial action goals (RAGs) established in the Record of Decision (ROD) or ADEC groundwater cleanup levels (from Table C of 18 AAC 75) are in bold type and gray shading. ROD chemicals of concern were analyzed by EPA Method 8260C.

1 Cleanup goal listed is an ADEC cleanup level and is not listed in the OU2 ROD.

2 Dissolved oxygen measured above theoretical maximum during the November 2010 sampling event in AP-10037MW. Theoretical maximum concentration is shown.

3 Sample is a Field Duplicate of the sample immediately above.

B - analytical result is qualified as a potential high estimate due to contamination present in a blank sample

btoc - below top of casing

J - analyte is reported between the detection limit and LOQ

LOD - limit of detection

LOQ - limit of quantitation

µg/L - micrograms per liter

mS/cm - milliSiemens per cemtimeter

msl - mean seal level

mV - millivolts

NA - not analyzed or not applicable

ND - not detected at the detection limit (LOD in parentheses. LOQ in parentheses for data prior to 2012.)

Q - result considered an estimate due to a quality control failure. If direction of bias is known, it is further indicated with a "L" (low) or "H" (high). mg/L - milligrams per liter

OU-2 DRMO Yard

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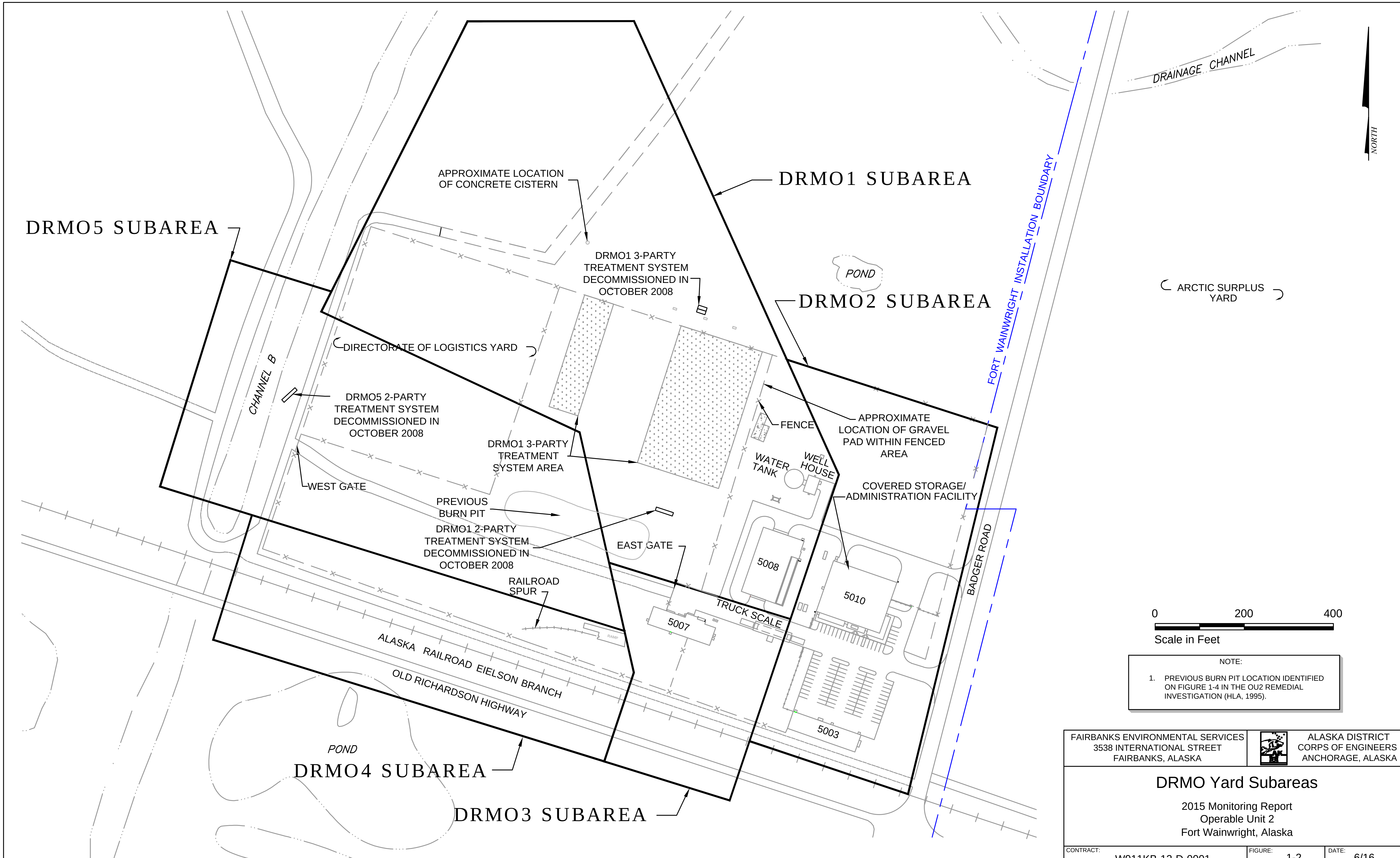


NOTE:

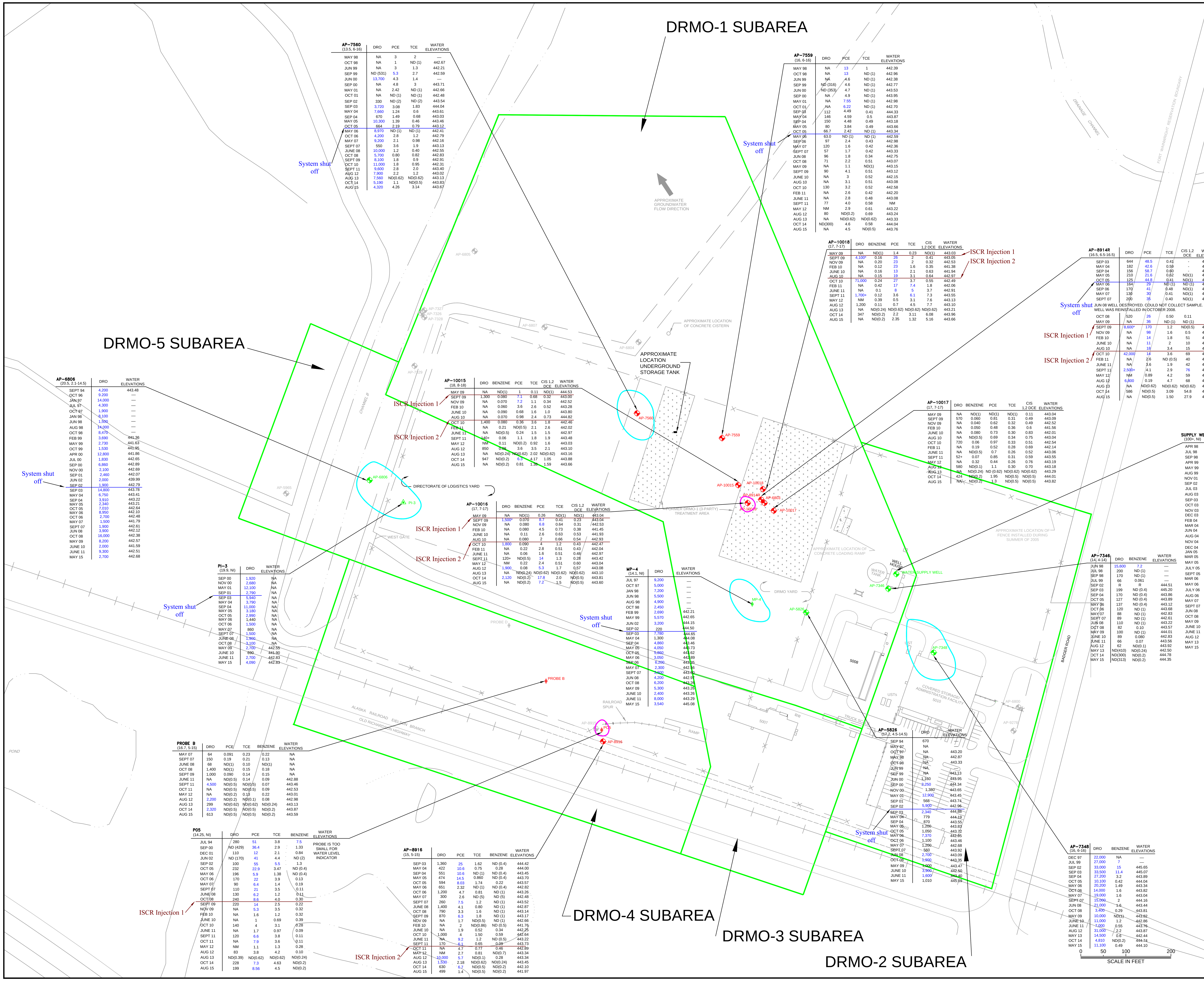
1. PREVIOUS BURN PIT LOCATION IDENTIFIED ON FIGURE 1-4 IN THE OU2 REMEDIAL INVESTIGATION (HLA, 1995).

FAIRBANKS ENVIRONMENTAL SERVICES 3538 INTERNATIONAL STREET FAIRBANKS, ALASKA	ALASKA DISTRICT CORPS OF ENGINEERS ANCHORAGE, ALASKA

DRMO Yard Subareas

2015 Monitoring Report
Operable Unit 2
Fort Wainwright, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-12-D-0001	1-2	6/16



LEGEND:

AP-7348	2-PARTY GROUNDWATER SAMPLING LOCATION
PI-3	2-PARTY GROUNDWATER SAMPLING LOCATION (PROBE)
AP-8914R	3-PARTY GROUNDWATER SAMPLING LOCATION
PO5	3-PARTY GROUNDWATER SAMPLING LOCATION (PROBE)
	APPROXIMATE 2015 DRO PLUME
	APPROXIMATE 2015 PCE PLUME
AP-6803	MONITORING WELL NOT SAMPLED
PI-1	PASSIVE INJECTION WELL
— X —	FENCE
AST	ABOVEGROUND STORAGE TANK
bgs	BELOW GROUND SURFACE
CIS 1,2 DCE	CIS-1,2-DICHLOROETHENE
DRO	DIESEL RANGE ORGANICS
GRO	GASOLINE RANGE ORGANICS
ISCR	IN SITU CHEMICAL REDUCTION
LOD	LIMIT OF DETECTION
LOQ	LIMIT OF QUANTITATION
NA	SAMPLE COLLECTED, BUT ANALYSIS NOT PERFORMED
ND	NOT DETECTED (LOD). LOQ IS SHOWN FOR DATA PRIOR TO 2012
NI	NO INFORMATION AVAILABLE
NGVD29	NATIONAL GEODETIC VERTICAL DATUM 1929
NM	NOT MEASURED
NS	NOT SAMPLED
PCE	TETRACHLOROETHENE
R	REJECTED VALUE BASED ON QUESTIONABLE ANALYTICAL DATA
TCE	TRICHLOROETHENE
UST	UNDERGROUND STORAGE TANK
—	DATA NOT AVAILABLE

NOTES:

1. **BOLD** NUMBERS REPRESENT CONCENTRATIONS THAT ARE AT OR ABOVE APPLICABLE CLEANUP LEVELS.
2. ALL ANALYTE CONCENTRATIONS REPORTED IN MICROGRAMS PER LITER (µg/L).
3. AP-8914 WAS NOT SAMPLED IN JUNE 2008 BECAUSE THE WELL HAD BEEN DESTROYED.
4. CLEANUP LEVELS FOR GRO CHANGED FROM 1,300 µg/L to 2,200 µg/L IN OCTOBER 2008.
5. DRMO-1 (2-PARTY), DRMO-5 (2-PARTY), AND DRMO-1 (3-PARTY) TREATMENT SYSTEMS WERE DECOMMISSIONED IN THE FALL OF 2008.
6. DRO EXCEEDANCES IN AP-10016, AP-10018 AND AP-8914R WERE LIKELY A RESULT OF ORGANIC MATERIAL INJECTED IN AUGUST 2009.
7. ISCR INJECTION COMPLETED AT THE DRMO1 (3-PARTY) AND DRMO4 SITES IN AUGUST 2009.
8. SECOND ISCR INJECTION COMPLETED AT THE DRMO1 (3-PARTY) SITE IN AUGUST 2010, AND SECOND ISCR INJECTION WAS COMPLETED AT THE DRMO 4 SITE IN SEPTEMBER 2011.
9. DRMO 2-PARTY SITES ARE SAMPLED IN THE SPRING AND DRMO 3-PARTY SITES ARE SAMPLED IN FALL STARTING IN 2009.
10. + IDENTIFIES SILICA GEL CLEANUP METHOD USED FOR AK102 (DRO) ANALYSIS IN 2011 (AP-10015, AP-10016, AP-10017, AP-10018, AND AP-8914R.
11. DATA FLAGS (QUALIFIERS) ARE NOT SHOWN DUE TO SPACE LIMITATIONS.

CLEANUP LEVELS (µg/L)

5.0	BENZENE
1,500	DRO
2,200	GRO
5.0	PCE
5.0	TCE
70	CIS 1,2 DCE

KEY:

CONTAMINANTS OF CONCERN

TOTAL DEPTH, SCREENED INTERVAL (bgs)

SAMPLE MONTH AND YEAR

CONCENTRATIONS EXCEEDING CLEANUP LEVELS

SEE LEGEND FOR ABBREVIATIONS.

WATER ELEVATIONS IN FEET (NGVD29)

CONCENTRATIONS IN MICROGRAMS PER LITER (µg/L)

AP-8914 (16.3, 5-15)	DRO	PCE	TCE	WATER ELEVATIONS
SEP 03	644	48.5	0.41	444.31
MAY 04	182	42.6	0.59	443.90
SEP 04	156	58.7	0.60	443.27
MAY 05	210	21.6	0.62	443.72
OCT 05	125	44.8	0.41	443.48

SCALE IN FEET: 0, 50, 100, 200

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FAIRBANKS, ALASKA

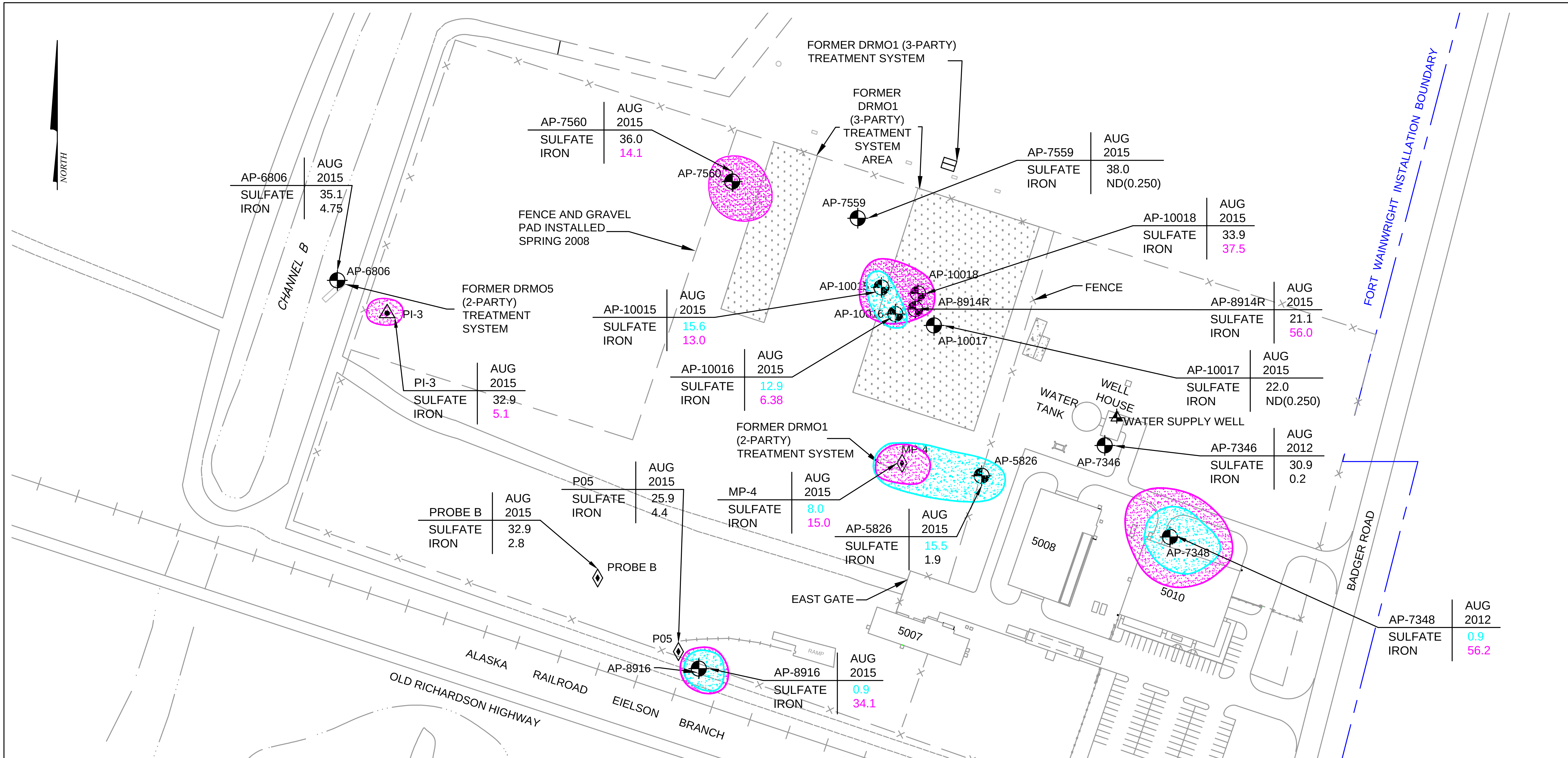
ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Contaminants of Concern Detected in DRMO Yard Groundwater Samples

2015 Monitoring Report
Operable Unit 2
Fort Wainwright, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-12-D-0001	3-1	6/16

FIGURE 3-1



LEGEND:

AP-8916	MONITORING WELL LOCATION AND NUMBER
PROBE B	GROUNDWATER PROBE LOCATION AND NUMBER
WATER SUPPLY WELL	WATER WELL LOCATION
LOD	LIMIT OF DETECTION
MG/L	MILLIGRAMS PER LITER
ND	NOT DETECTED. LIMIT OF DETECTION (LOD) IN PARENTHESIS

NOTES:

1. GROUNDWATER GEOCHEMISTRY BASED ON 2015 MONITORING RESULTS. WITH THE EXCEPTION OF GROUNDWATER GEOCHEMISTRY IN THE VICINITY OF AP-7348 AND AP-7346. GEOCHEMISTRY FROM 2012 USED IN THIS AREA.
2. DATA REPORTED IN MILLIGRAMS PER LITER (MG/L)

KEY:

SULFATE REDUCING = SULFATE <20 MG/L

FERRIC IRON REDUCING = IRON >5 MG/L

FAIRBANKS ENVIRONMENTAL SERVICES
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FAIRBANKS, ALASKA

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Approximate Regions of Reduced Groundwater Geochemistry

2015 Monitoring Report
Operable Unit 2
Fort Wainwright, Alaska

CONTRACT: W911KB-12-D-0001 | FIGURE: 3-2 | DATE: 6/16

Table 3-2 - 2011 - 2015 Groundwater Sample Results
DRMO1 (3-Party) Sub-Area

Well Number	Relative Location	Sample Number	Date	Water Elevation (feet NGVD29)	ORP (mV)	Dissolved Oxygen (mg/L)	pH	Conductivity (mS/cm)	Dissolved Iron (mg/L)	Sulfate (mg/L)	Alkalinity (mg/L)	Total Organic Carbon (mg/L)	Diesel Range Organics (µg/L)	ROD Chemicals of Concern (µg/L)						
														Benzene	Trichloro-ethene (TCE)	Tetrachloro-ethene (PCE)	Vinyl Chloride	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene
ROD CLEANUP LEVELS													**1,500[1]**	**5**	**5**	**5**	**2**	**7**	**70**	**70**
AP-10017	Upgradient	11FW2A05WG	2/23/2011	442.14	-27.3	0.72	6.6	0.443	NA	NA	196	4.83	NA	0.19 J,B	0.28 J	0.52	ND(0.5)	ND(0.5)	0.69	0.14 J
		11FW2A12WG	6/2/2011	443.06	28.8	0.9	6.5	0.414	0.0234	19	182	3.79	NA	ND(0.50)	0.26 J	0.7	ND(0.5)	ND(0.5)	0.52	0.09 J
		11FW2A23WG[3]	9/21/2011	443.55	-0.3	1.74	6.5	0.416	0.0329 J	28.3	186	4.46	52 J,B	0.070 J	0.31 J	0.85	ND(0.5)	ND(0.5)	0.59	0.10 J
		12FW2A06WG	5/30/2012	443.19	91.7	0.36	6.6	0.422	0.027	22.8	171	2.96	NA	0.32 J	0.26 J	0.44 J	ND(0.1)	ND(0.2)	0.76	0.16 J
		12FW2A07WG	8/21/2012	443.18	220.7	0.19	6.8	0.449	0.01	26.7	181	3.72	580 J,ML	ND(0.10)	0.30 J	1.1	ND(0.1)	ND(0.2)	0.70	0.18 J
		13FW2A07WG	8/27/2013	443.29	79.9	0.19	6.4	0.399	ND(0.62)	24.8	148	4.12	NA	ND(0.24)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU212WG	10/9/2014	444.01	41.3	0.35	6.4	0.396	ND(0.25)	27.5	154	5.38	424 J	ND(0.2)	ND(0.5)	2.0	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
		15FWOU224WG	8/24/2015	443.82	15.6	0.20	6.2	0.362	ND(0.25)	22.0	152	4.4	NA	ND(0.2)	ND(0.5)	1.3	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
AP-8914R	Source Area	11FW2A04WG	2/23/2011	442.10	-67.1	0.62	6.2	1.446	NA	NA	523	327	NA	0.29 J,B	ND(0.5)	2.6	ND(0.5)	0.73	40	0.23 J
		11FW2A14WG	6/2/2011	443.01	-14.3	0.7	6.2	1.258	104	0.51	452	259	NA	0.13 J	1.9	3.6	ND(0.5)	0.69	42 J	0.24 J
		11FW2A24WG[3]	9/21/2011	443.58	-86.9	2.01	6.4	1.367	134 J	2	598	249	**2,500**	0.09 J	2.9	4.1	0.33 J	1.0	**76**	0.33 J
		12FW2A04WG	5/30/2012	443.14	-84.7	0.28	6.6	1.467	112 QL	0.45 QL	552	128	NA	0.32 J	4.2	0.89	0.35 J	0.6	59	0.7
		12FW2A09WG	8/21/2012	443.11	-92.6	0.19	6.8	1.431	97.4 QL	2.01 Q	658	98.1	**6,800**	0.09 J	4.7	0.17 J	0.33 J	0.55	67	0.9
		12FW2A10WG[2]							99.1 QL	0.59 Q	638	104	**5,900**	0.10 J	4.7	0.19 J	0.34 J	0.56	68	0.98
		13FW2A01WG	8/26/2013	443.3	-105.3	0.20	6.1	0.958	86.2	4.1	371 Q	16.4	NA	ND(0.24)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		13FW2A02WG[2]							86.4	4.13	245 Q	17.1	NA	ND(0.24)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU207WG	10/9/2014	444.0	-52.2	0.24	6.3	1.006	74.2	3.35	428	31.6	586 J	ND(0.2)	3.09	ND(0.5)	0.48 J	ND(0.5)	54.8	1.98
		15FWOU223WG	8/24/2015	443.7	-86.8	0.17	6.2	0.581	56.0	21.1	193	10.3	NA	ND (0.2)	1.50	ND(0.5)	ND(0.5)	ND(0.5)	27.9	3.65
AP-10016		11FW2A02WG	2/23/2011	442.04	-62.3	0.73	6.6	0.479	9.03	5.2	231	6.80	NA	0.22 J,B	0.51	2.8	ND(0.5)	ND(0.5)	0.42 J	0.24 J
		11FW2A03WG[2]							NA	NA	NA	NA	NA	0.22 J,B	0.50	2.3	ND(0.5)	ND(0.5)	0.43 J	0.23 J
		11FW2A13WG	6/2/2011	442.97	-1.7	0.86	6.6	0.45	8.82	4.6	208	5.30	NA	0.06 J	0.51	1.6	ND(0.5)	ND(0.5)	0.48 J	0.2 J
		11FW2A21WG[3]	9/21/2011	443.42	-17.0	1.88	6.4	0.443	4.35 J	17.7	208	6.09	120	ND(0.5)	1.30	**14.0**	ND(0.5)	ND(0.5)	0.28 J	0.1J
		12FW2A03WG	5/30/2012	443.04	-35.4	0.25	6.6	0.467	5.88	6.6	199	5.55	NA	0.22 J	0.51	2.4	ND(0.1)	ND(0.2)	0.60	0.24 J
		12FW2A08WG	8/21/2012	443.08	18.4	1.25	6.7	0.489	4.55	12.9	2430	6.00	**1,900**	0.08 J	1.70	**5.3**	ND(0.1)	ND(0.2)	0.57	0.33 J
		13FW2A08WG	8/27/2013	443.10	-75.4	0.15	6.7	0.458	8.90	10.9	180	7.32	NA	ND(0.24)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU206WG	10/9/2014	443.81	46.9	0.16	6.3	0.515	0.463J	46.9	207	9.81	**2,120**	ND(0.2)	2.0	**17.8**	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
		15FWOU220WG	8/24/2015	443.60	-35.1	0.48	5.7	0.453	6.38	12.9	200	11.5	NA	ND (0.2)	1.5	**7.2**	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)

Table 3-2 - 2011 - 2015 Groundwater Sample Results
DRMO1 (3-Party) Sub-Area

Well Number	Relative Location	Sample Number	Date	Water Elevation (feet NGVD29)	ORP (mV)	Dissolved Oxygen (mg/L)	pH	Conductivity (mS/cm)	Dissolved Iron (mg/L)	Sulfate (mg/L)	Alkalinity (mg/L)	Total Organic Carbon (mg/L)	Diesel Range Organics (µg/L)	ROD Chemicals of Concern (µg/L) Benzene	Trichloro-ethene (TCE)	Tetrachloro-ethene (PCE)	Vinyl Chloride	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene
ROD CLEANUP LEVELS													**1,500[1]**	**5**	**5**	**5**	**2**	**7**	**70**	**70**
AP-10018	Source Area	11FW2A06WG	2/23/2011	442.06	-52.5	0.76	6.0	2.127	NA	NA	627	ND(0.50) QL	NA	0.42 J,B	**7.40**	**17**	ND(0.5)	ND(0.50)	1.80	0.49 J
		11FW2A10WG	6/2/2011	442.91	-48.3	0.67	6.2	1.018	168	0.20 J,Q	318	187	NA	0.1 J	5.0	**8.0**	ND(0.5)	0.1 J	3.7	0.83
		11FW2A11WG[2]							170	0.58	303	188	NA	0.1 J	5.0	**8.4**	ND(0.5)	0.09 J	3.7	0.85
		11FW2A22WG[3]	9/21/2011	443.55	-99.9	1.87	6.4	1.040	170 J	0.7	401	163	**1,700**	0.12 J	**6.10**	3.6	0.11 J	0.15 J	7.3	1.7
		12FW2A05WG	5/30/2012	443.13	-87.4	0.36	6.6	0.830	84.50	2.2	283	12.4	NA	0.39 J	3.10	0.5	0.21 J	0.1 J	7.6	4.8
		12FW2A12WG	8/21/2012	443.10	-96.1	0.28	6.8	0.848	79.70	2.1	33.1 B	19.0	1,200	0.11 J	4.50	0.7	0.17 J	ND(0.2)	7.7	6.6
		13FW2A06WG	8/27/2013	443.21	-106.7	0.15	6.6	0.701	55.60	7.33	243	7.12	NA	ND(0.24)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	6.97
		14FWOU213WG	10/9/2014	443.96	-72.1	0.10	6.5	0.775	49.50	39.20	262	10.5	347 J	ND(0.2)	3.11	2.17	ND(0.5)	ND(0.5)	6.08	10.1
		15FWOU222WG	8/24/2015	443.66	-136.8	0.16	6.4	0.565	37.50	33.90	203	7.68	NA	ND (0.2)	1.32	2.35	ND (0.5)	ND (0.5)	5.16	10.8
AP-7559	Downgradient	11FW2A07WG	2/23/2011	442.20	-3.6	1.13	6.6	0.454	NA	NA	205	3.92	NA	0.51 B	0.42 J	2.60	ND(0.5)	ND(0.5)	0.24 J	ND(0.50)
		11FW2A08WG	6/1/2011	443.08	138	1.53	6.6	0.415	0.0048	25.4	181	3.26	NA	ND(0.50)	0.48 J	2.8	ND(0.5)	ND(0.5)	0.27 J	0.08 J
		11FW2A15WG	9/20/2011	443.60	7.2	1.33	6.5	0.404	0.0041 J	29.7	180	4.08	77 J	ND(0.5)	0.58	4.0	ND(0.5)	ND(0.5)	0.36 J	0.09 J
		12FW2A01WG	5/30/2012	443.22	318.6	0.31	6.4	0.447	0.025	29.6	175	2.26	NA	0.17 J	0.61	2.9	ND(0.1)	ND(0.2)	0.46 J	0.16 J
		12FW2A13WG	8/21/2012	443.24	42.8	0.83	6.9	0.459	0.004	31.5	187	2.32	80 J	ND(0.10)	0.69	ND(0.20)	ND(0.1)	ND(0.2)	0.43 J	0.14 J
		13FW2A03WG	8/26/2013	443.33	66.2	0.27	6.2	0.419	ND(1)	29	155	2.66	NA	ND(0.24)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU214WG	10/9/2014	444.04	46	0.24	6.4	0.524	ND(0.25)	47	211	5	ND(300)	ND(0.2)	0.58 J	4.6	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
		15FWOU219WG	8/21/2015	443.76	60.5	1.49	6.2	0.476	ND (0.25)	38	196	4.4	NA	ND (0.2)	ND (0.5)	4.5	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
AP-7560		11FW2A16WG	9/21/2011	443.40	-58.9	1.59	6.3	0.458	19.2 J	21.5	205	20.6	**9,600**	0.06 J	2.0	2.8	ND(0.5)	ND(0.5)	0.44 J	0.75
		12FW2A15WG	8/21/2012	443.02	-27.7	0.48	6.4	0.381	15.2	6.19	197	22.5	**7,900**	ND(0.10)	1.2	2.2	ND(0.1)	ND(0.2)	0.30 J	0.43 J
		13FW2A04WG	8/26/2013	443.12	-62.9	0.26	6.0	0.298	15.2	8.66	108	25.7	**7,560**	ND(0.24)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU208WG	10/9/2014	443.83	29.7	0.46	6.0	0.387	19.2 J+	1.33	159	47	**5,150**	ND(0.2)	ND(0.5)	1.05	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
		14FWOU209WG							20.4	1.04	157	48.7	**5,190**	ND(0.2)	ND(0.5)	1.04	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
		15TFTOU225WG	8/24/2015	443.67	-80.7	1.03	6.2	0.534	13.8	36.40	208	13.9	**4,320**	ND (0.2)	2.51	4.26	ND (0.5)	ND (0.5)	1.14	1.11
		15TFTOU226WG[2]							14.1	36.00	213	15.4	**3,880**	ND (0.2)	3.14	3.95	ND (0.5)	ND (0.5)	1.01	1.36

Table 3-2 - 2011 - 2015 Groundwater Sample Results
DRMO1 (3-Party) Sub-Area

Well Number	Relative Location	Sample Number	Date	Water Elevation (feet NGVD29)	ORP (mV)	Dissolved Oxygen (mg/L)	pH	Conductivity (mS/cm)	Dissolved Iron (mg/L)	Sulfate (mg/L)	Alkalinity (mg/L)	Total Organic Carbon (mg/L)	Diesel Range Organics (µg/L)	ROD Chemicals of Concern (µg/L)						
														Benzene	Trichloro-ethene (TCE)	Tetrachloro-ethene (PCE)	Vinyl Chloride	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene
ROD CLEANUP LEVELS													**1,500[1]**	**5**	**5**	**5**	**2**	**7**	**70**	**70**
AP-10015	Downgradient	11FW2A01WG	2/23/2011	442.02	-125.1	0.64	6.6	0.635	NA	NA	269	25.3	NA	0.21 J,B	2.10	ND(0.50)	ND(0.5)	ND(0.5)	2.6	0.68
		11FW2A09WG	6/2/2011	442.97	-74.0	1.06	6.6	0.572	29.20	0.20 J	244	15.2	NA	ND(0.50)	1.50	0.24 J	ND(0.5)	ND(0.5)	1.5	0.6
		11FW2A17WG[3]	9/20/2011	443.48	-102.2	1.14	6.6	0.531	24.1 J	10.8	255	7.59	140	0.06 J	1.80	1.10	ND(0.5)	ND(0.5)	1.9	1.00
		12FW2A02WG	5/30/2012	443.03	-44.1	0.15	6.7	0.529	17.40	8.6	222	4.67	NA	0.11 J	0.92	ND(0.20)	ND(0.1)	ND(0.2)	1.6	1.10
		12FW2A11WG	8/21/2012	443.10	-33.9	0.88	6.7	0.622	16.50	26.4	30.2 B	6.00	850 J	0.08 J	3.50	3.60	ND(0.1)	ND(0.2)	2.1	1.70
		13FW2A05WG	8/27/2013	443.16	-60.4	0.21	5.9	0.538	19.90	13.4	203	5.88	NA	ND(0.24)	2.02	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU205WG	10/9/2014	443.88	40.4	0.22	6.3	0.529	10.20	51.9	206	8.05	947	ND(0.2)	4.17	**6.29**	ND(0.5)	ND(0.5)	1.05	1.45
		15FWOU221WG	8/24/2015	443.66	-87.4	0.20	6.3	0.473	13.00	15.6	195	8.94	NA	ND (0.2)	1.38	0.81 J	ND (0.5)	ND (0.5)	1.59	2.54

Notes

Analytes exceeding remedial action goals (RAGs) established in the Record of Decision (ROD) or ADEC groundwater cleanup levels (from Table C of 18 AAC 75) are in bold type and gray shading.

DRO analysis in AP-10015, AP-10016, AP-10017, AP-10018, and AP-8914R in September 2011 included the silica gel cleanup method.

[1] Cleanup goal listed is an ADEC cleanup level and is not listed in the OU2 ROD.

[2] Sample is a Field Duplicate of the sample immediately above.

[3] The DRO results for 11FW2A17WG, 11FW2A21WG, 11FW2A22WG, 11FW2A22WG, 11FW2A23WG,11FW2A24WG represent the result following silica gel cleanup.

Acronyms/Abbreviations

btoc - below top of casing
LOD - limit of detection
LOQ - limit of quantitation
µg/L - micrograms per liter
mg/L - milligrams per liter
mS/cm - micro Siemens per centimeter
msl - mean seal level
mV - millivolts
NA - not analyzed or not applicable
ROD - Record of Decision

Data Qualifiers

ND - Not detected at the detection limit (LOD in parentheses; LOQ in parentheses for data prior to 2012.)
B - Result is qualified as a potential high estimate due to contamination present in a blank sample
J - Result is estimated due to a QC issue or because it is less than the LOQ. If result is biased low or high, it is specified as "J-" and "J+", respectively (for 2014 data or older).
Q - Result is estimated due to a QC failure (pre-2014 data only). If direction of bias is known, it is further indicated with a "L" (low) or "H" (high).
M - Result is biased due to matrix interference (pre-2014 data only). If direction of bias is known, it is further indicated with a "L" (low) or "H" (high).

Table 3-3 - 2011 - 2015 Groundwater Sample Results
DRMO4 (3-Party) Sub-Area

Well Number	Relative Location	Sample Number	Date	Water Elevation (feet NGVD29)	ORP (mV)	Dissolved Oxygen (mg/L)	pH	Conductivity (mS/cm)	Dissolved Iron (mg/L)	Sulfate (mg/L)	Alkalinity (mg/L)	Total Organic Carbon (mg/L)	Diesel Range Organics (µg/L)	ROD Chemicals of Concern (µg/L)						
														Benzene	Trichloro-ethene (TCE)	Tetrachloro-ethene (PCE)	Vinyl Chloride	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene
ROD CLEANUP LEVELS													**1,500[1]**	**5**	**5**	**5**	**2**	**7**	**70**	**70**
AP-8916	Upgradient	11FW2C02WG	6/3/2011	443.22	61.0	1.02	6.4	0.538	6.0	17.3	243	4.3	NA	ND(0.5)	1.2 QH	**9.2 QH**	ND(0.5)	ND(0.5)	0.2 J,QH	ND(0.5)
		11FW2C04WG	9/20/2011	443.73	28.7	2.37	5.6	0.453	1.92 J	22.2	206	3.9	170 J	0.09 J	0.65	**6.1**	ND(0.5)	ND(0.5)	0.23 J	ND(0.5)
		11FW2C05WG[2]							1.76 J	22.5	217	3.5	200 J	0.08 J	0.68	**6.2**	ND(0.5)	ND(0.5)	0.24 J	ND(0.5)
		11FW2C08WG	10/27/2011	442.89	-94.5	0.59	5.8	1.233	80.6	8.9	493	720	NA	0.46 J,QH	0.77 QH	4.7 QH	ND(0.5)	ND(0.5)	ND(0.50)	ND(0.5)
		11FW2C09WG[2]							73.2 QL	8.6	466	619	NA	0.43 J,QH	0.67 QH	4.4 QH	ND(0.5)	ND(0.5)	ND(0.50)	ND(0.5)
		12FW2C03WG	5/31/2012	443.34	-55.3	0.26	6.1	1.056	108	0.38 J	293	261	NA	ND(0.7)	0.75 Q	2.7 J,ML,Q	ND(0.1)	ND(0.2)	0.26 J,Q	ND(0.2)
		12FW2C04WG[2]							110	0.5	304	264	NA	ND(0.49)	0.81 Q	2.3 J,Q	ND(0.1)	ND(0.2)	0.26 J,Q	ND(0.2)
		12FW2C07WG	8/22/2012	443.34	-98.7	0.13	6.1	1.010	125	0.6	307	207	**10,000**	0.26 J,QH	ND(0.1)	**5.1 QH**	ND(0.1)	ND(0.2)	0.26 J,QH	ND(0.2)
		12FW2C08WG[2]							126	0.5	307	198	**9,600**	0.28 J,QH	ND(0.1)	**5.7 QH**	ND(0.1)	ND(0.2)	0.27 J,QH	ND(0.2)
		13FW2C03WG	8/27/2013	443.45	-102.9	0.19	6.6	0.560	42.5	0.4	170	29.2	1,360	ND(0.24)	ND(0.62)	ND(0.62) Q	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		13FW2C04WG[2]							39.3	0.4	169	27.9	**1,530**	ND(0.24)	ND(0.62)	2.18 Q	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU215WG	10/9/2014	442.10	21.9	0.74	6.6	0.761	20.1	5.8	206	8.05	630	ND(0.2)	ND(0.5)	**6.7**	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
		15FWOU216WG	8/21/2015	441.97	-48.3	0.24	5.4	0.529	34.1	0.9	213	11.1	499 B	ND (0.2)	ND (0.5)	1.4	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
PO5	Source Area	11FW2C03WG	6/6/2011	NM	5.0	5.73	6.3	0.422	5.0	24.6	165	3.1	NA	0.09 J	0.97	1.7	ND(0.5)	ND(0.5)	0.28 J	ND(0.5)
		11FW2C06WG	9/20/2011	NM	-56.9	1.55	6.6	0.434	5.1	30.3	181	3.8	120 J	0.11 J	3.8	**6.6**	ND(0.5)	ND(0.5)	0.49 J	0.07 J
		11FW2C10WG	10/27/2011	NM	-76.1	0.19	6.8	0.433	5.1	37.4	205	3.8	NA	0.11J	3.6	**7.9**	ND(0.5)	ND(0.5)	0.40 J	ND(0.5)
		12FW2C02WG	5/31/2012	NM	-63.9	0.21	6.8	0.432	4.5	23.4	158	2.3	NA	0.28 J	1.3	1.1	ND(0.1)	ND(0.2)	0.38 J	0.13 J
		12FW2C06WG	8/22/2012	NM	-74.5	0.15	6.8	0.468	4.9	26.4	227	2.6	83 J	0.10 J	4.2	3.8	ND(0.1)	ND(0.2)	0.51	0.26 J
		13FW2C02WG	8/27/2013	NM	-76.4	0.74	6.8	0.421	4.7	25.1	156	2.8	ND(0.39)	ND(0.24)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU211WG	10/9/2014	NM	16.5	4.7	6.5	0.501	5.1	28.4	213	4.7	228 J	ND(0.2)	4.63	**7.28**	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
		15FWOU217WG	8/21/2015	NM	-60.1	1.71	6.5	0.446	4.4	25.9	186	3.8	199 J,B	ND (0.2)	4.5	**8.56**	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)

Table 3-3 - 2011 - 2015 Groundwater Sample Results
DRMO4 (3-Party) Sub-Area

Well Number	Relative Location	Sample Number	Date	Water Elevation (feet NGVD29)	ORP (mV)	Dissolved Oxygen (mg/L)	pH	Conductivity (mS/cm)	Dissolved Iron (mg/L)	Sulfate (mg/L)	Alkalinity (mg/L)	Total Organic Carbon (mg/L)	Diesel Range Organics (µg/L)	ROD Chemicals of Concern (µg/L)						
														Benzene	Trichloro-ethene (TCE)	Tetrachloro-ethene (PCE)	Vinyl Chloride	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene
ROD CLEANUP LEVELS													**1,500[1]**	**5**	**5**	**5**	**2**	**7**	**70**	**70**
Probe B	Downgradient	11FW2C01WG	6/3/2011	442.78	111.8	1.02	6.3	0.569	4.6	29.2	267	3.6	NA	0.09 J	0.11 J	ND(0.5)	ND(0.5)	ND(0.5)	0.19 J	0.08 J
		11FW2C07WG	9/20/2011	443.46	-15.0	2.29	6.4	0.609	1.8 J	36.5	312	16.5	**4500**	0.07 J	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	0.13 J	ND(0.5)
		11FW2C11WG	10/27/2011	442.53	19.5	0.47	6.6	0.534	2.9	34.0	264	7.4	NA	0.090 J	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	0.21 J	0.070 J
		12FW2C01WG	5/31/2012	443.01	-13.6	0.33	6.4	0.716	4.6	40.2	330	3.8	NA	0.22 J	0.13 J	ND(0.2)	ND(0.1)	ND(0.2)	0.14 J	ND(0.2)
		12FW2C05WG	8/22/2012	442.98	-7.0	0.26	6.5	0.733	2.5	40.0	387	11.0	**2,200**	0.08 J	ND(0.1)	ND(0.2)	ND(0.1)	ND(0.2)	0.17 J	ND(0.2)
		13FW2C01WG	8/26/2013	443.13	-34.6	0.26	6.3	0.545	3.2	30.0	213	3.3	299 J	ND(0.24)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)	ND(0.62)
		14FWOU210WG	10/9/2014	443.87	30.3	0.5	6.5	0.903	5.5	67.6	442	19.3	**2,320**	ND(0.2)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
		15FWOU218WG	8/21/2015	443.59	-21.3	0.25	6.3	0.616	2.8	32.9	266	6.6	613 J,B	ND (0.2)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)

Notes

Analytes exceeding remedial action goals (RAG) established in the Record of Decision (ROD) or ADEC groundwater cleanup levels (from Table C of 18 AAC 75) are in bold type and gray shading.

1 Cleanup goal listed is an ADEC cleanup level and is not listed in the OU2 ROD.

2 Sample is a Field Duplicate of the sample immediately above.

Acronyms / Abbreviations

btoc - below top of casing
LOD - limit of detection
LOQ - limit of quantitation
µg/L - micrograms per liter
mg/L - milligrams per liter
mS/cm - milliSiemens per cemtimeter
msl - mean seal level
mV - millivolts
NA - not analyzed or not applicable
NM - not measured
ROD - Record of Decision

Data Qualifiers

ND - Not detected at the detection limit (LOD in parentheses; LOQ in parentheses for data prior to 2012.)
B - Result is qualified as a potential high estimate due to contamination present in a blank sample
J - Result is estimated due to a QC issue or because it is less than the LOQ. If result is biased low or high, it is specified as "J-" and "J+", respectively (for 2014 data and later).
Q - Result is estimated due to a QC failure (pre-2014 data only). If direction of bias is known, it is further indicated with a "L" (low) or "H" (high).
M - Result is biased due to matrix interference (pre-2014 data only). If direction of bias is known, it is further indicated with a "L" (low) or "H" (high).

Table 1-1. Summary of DRMO Yard Subareas

Subarea	Regulatory Authority	Location within DRMO Yard	Current (2015) Contaminants of Concern above RAGs	Remediation Status
DRMO1	OU2 ROD (3-Party)	Central and northwest (extending northwest)	PCE, DRO[1]	OU2 AS/SVE Treatment System (1997–2005) ISCR Treatability Study (2009, 2010)
	2-Party		DRO	DRMO1 AS/SVE Treatment System (1996-2003)
DRMO2 (Former Building 5001)	2-Party	Eastern quarter	DRO	None
DRMO3	2-Party	South central	None	None
DRMO4	OU2 ROD (3-Party)	Southwest	PCE	ISCR Treatability Study (2009, 2011)
DRMO5	2-Party	Central west (across Channel B)	DRO	DRMO5 AS/SVE Treatment System (1996-2003)

[1] The contaminants of concern for DRMO 3-Party sites were based on contaminants with federal and state maximum contaminant levels (MCLs). DRO does not have a MCL and the ROD states that natural attenuation will be relied on to attain Alaska Water Quality Standards (AWQS) after the MCLs are achieved through active remediation.

AS/SVE – air sparging/soil vapor extraction; ISCR – in-situ chemical reduction; RAG – remedial action goal

Table 2-1. Summary of the 2015 OU2 Groundwater Monitoring Program

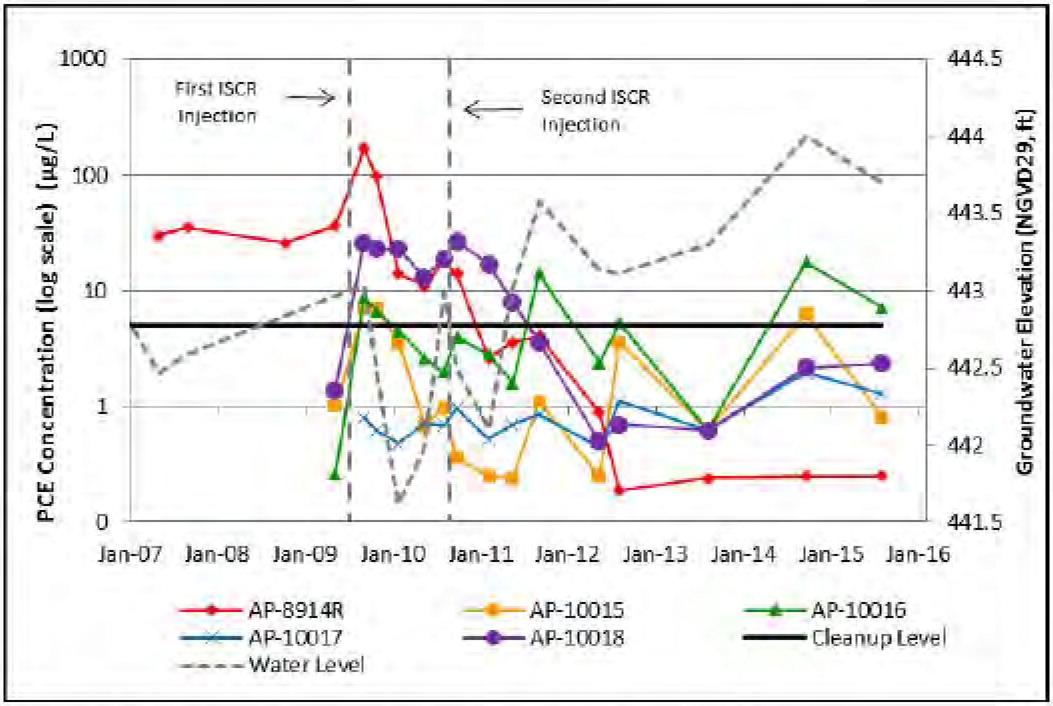
OU2 Site	Subarea/ Site	Number of Wells/Probes	Contaminant Analyses[1]	NA Analyses[3]	Monitoring Frequency/Sample Collected in 2015
DRMO1 (3-Party)	DRMO1	7	DRO[2], VOC	Iron, sulfate, TOC, alkalinity	Annual/Yes
DRMO4 (3-Party)	DRMO4	3	DRO, VOC		Annual/Yes
DRMO1 (2-Party)	DRMO1	2	DRO	Iron, sulfate	Five Year/Yes
DRMO5 (2-Party)	DRMO5	2			Five Year/Yes
Building 5010 (2-Party)	DRMO2	2	DRO, VOC	–	Annual/Yes
Water Supply Well (2-Party)	DRMO1	1	GRO, DRO, VOC, SVOC	–	Annual/Yes
Former Building 1168 (3-Party)	Leach Well	3	GRO, DRO, VOC	Iron, sulfate	Annual/Yes

NA – Natural Attenuation SVOC – semi-volatile organic compounds

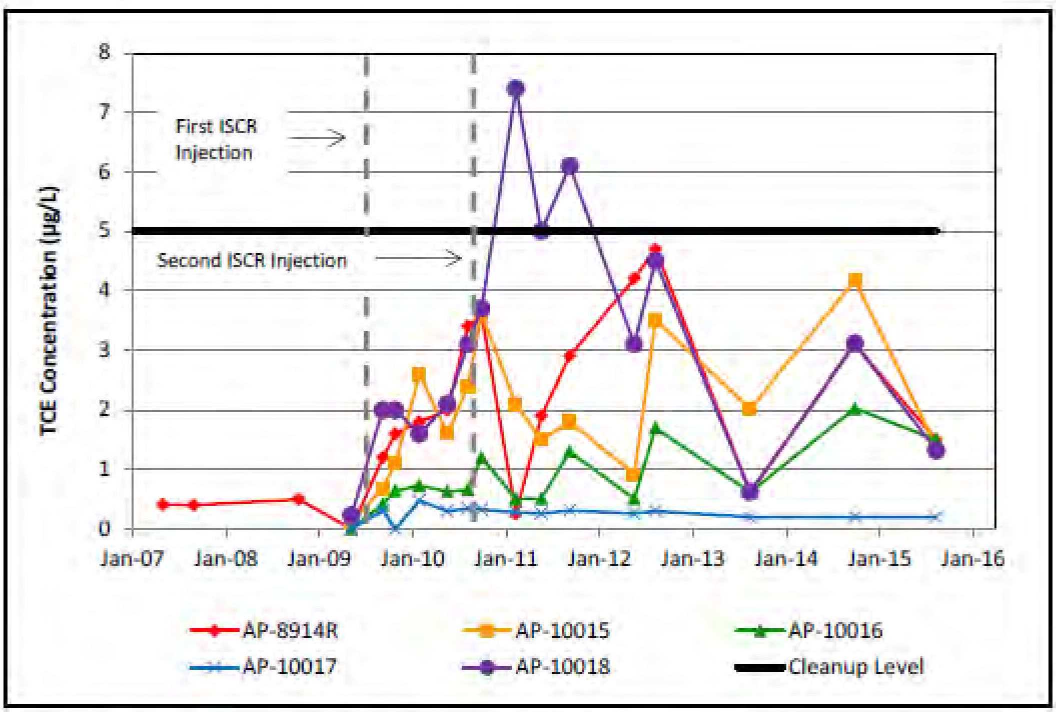
[1] Contaminant analyses were conducted by the following methods: VOC (8260B), SVOC (8270D), GRO (AK101), and DRO (AK102)

[2] Only one well (AP-7560) in the DRMO1 (3-Party) area is analyzed for DRO

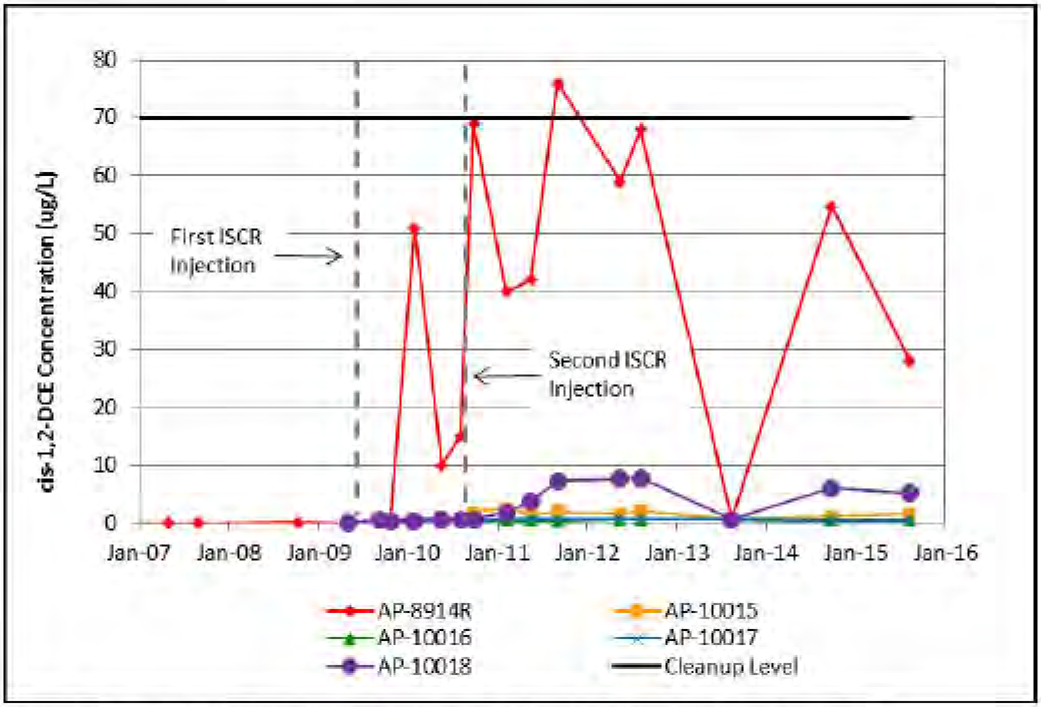
[3] Natural attenuation analyses were conducted by the following methods: iron (6020A), sulfate (300.0), total organic carbon (TOC) (9060A), and alkalinity (2320B)



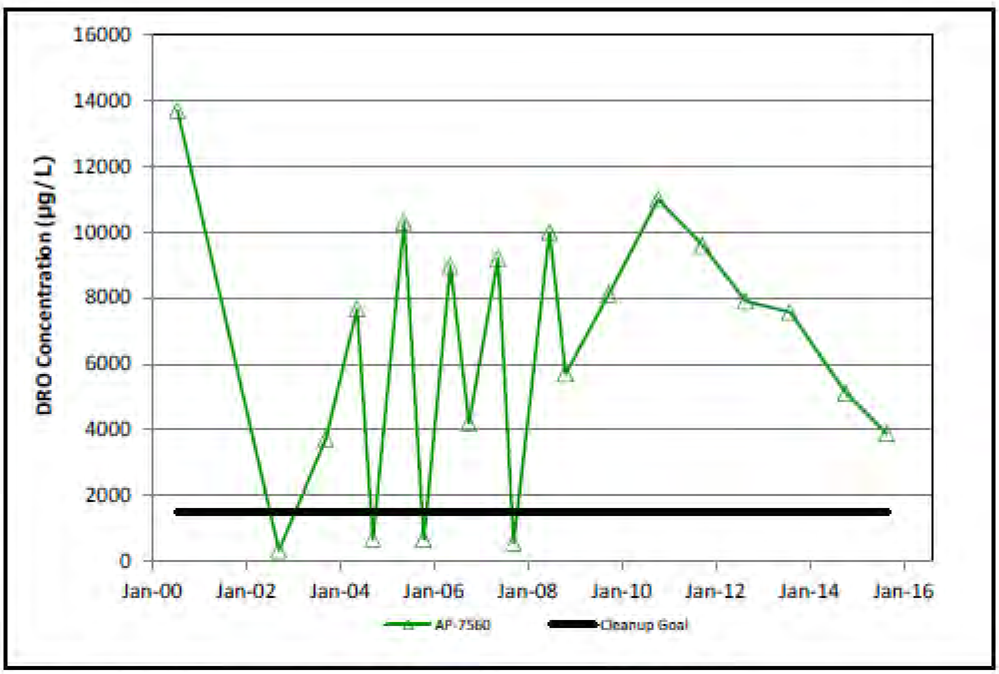
Graph 3-1. PCE Concentrations in the DRMO1 ISCR Treatment Area



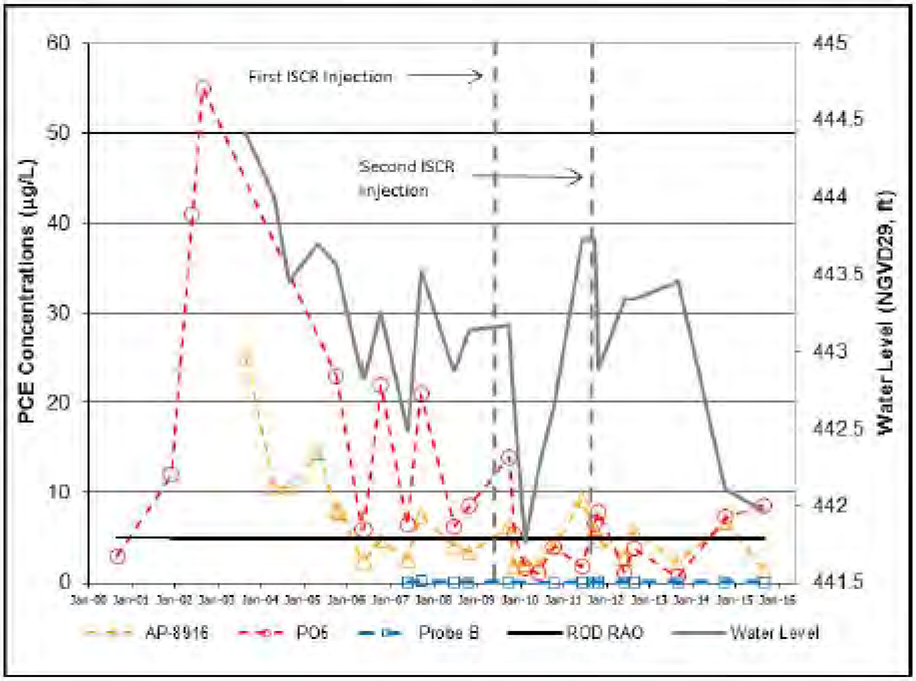
Graph 3-2. TCE Concentrations in the DRMO1 ISCR Treatment Area



Graph 3-3. cis-1,2-DCE Concentrations in the DRMO1 ISCR Treatment Area



Graph 3-4. DRO Concentration in Groundwater in AP-7560



Graph 3-5. PCE Concentration in DRMO4 Wells

Table 3-4. Mann-Kendall Trend Analysis for DRMO1 (3-Party) Wells

Well	Relative Location to Injection Area	Contaminants of Concern	
		PCE	TCE
AP-10017	Upgradient	Increasing[1]	Increasing[1]
AP-8914R	Within treatability study area	**Decreasing[2]**	Increasing[1]
AP-10016		**No Trend[3]**	Increasing[1]
AP-10018		**Decreasing[5]**	**Stable[1,4]**
AP-10015	Downgradient of treatability study area	**No Trend**	No Trend
AP-7559		Stable	No Trend
AP-7560		No Trend	Potentially Decreasing[1]

Trends in **bold type** exceeded the RAG during the time period used in the LTMO analysis (2009-2015).
[1] Indicates Linear Regression trend was used instead of the Mann-Kendall trend since there was a higher confidence in the trend.
[2] PCE exceeded the RAG in 2009 and 2010, but was less than the RAG between 2011 and 2015.
[3] PCE was above the RAG in 2015.
[4] TCE exceeded the RAG between February and September 2011, but has remained below the RAG since May 2012.
[5] PCE exceeded the RAG between 2009 and June 2011, but has remained below the RAG since September 2011.

Table 3-5. Mann-Kendall Trend Analysis for DRMO4 (3-Party) Wells

Well	Relative Location to Injection Area	Contaminants of Concern	
		TCE	PCE
AP-8916	Within 2011 injection area	Potentially Decreasing	**Stable**[1]
PO5	Within 2009 injection area	Potentially Increasing	**No Trend**
Probe B	Downgradient	Stable[2]	Stable[2]

Trends in **bold type** exceeded the RAG during the time period used in the LTMO analysis (2009-2015).

[1] The trend is based on Linear Regression since it was determined with greater confidence than the Mann-Kendall trend.

[2] Trend based on trace and/or non-detect results.

MAROS Summary 1—DRMO1 Statistical Trend Analysis Summary

MAROS Statistical Trend Analysis Summary

Project: DRMO1 3-Party

Location: Fort Wainwright

User Name: FES

State: Alaska

Time Period: 9/1/2009 **to** 8/24/2015

Consolidation Period: No Time Consolidation

Consolidation Type: Median

Duplicate Consolidation: Average

ND Values: Detection Limit

J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Average Conc. (mg/L)	Median Conc. (mg/L)	All Samples "ND" ?	Mann-Kendall Trend	Linear Regression Trend
DIESEL COMPONENTS								
AP-10015	T	4	4	9.2E-01	1.1E+00	No	S	S
AP-10016	S	4	4	1.3E+00	1.7E+00	No	NT	S
AP-10017	S	4	4	4.8E-01	5.8E-01	No	S	S
AP-10018	S	4	4	2.0E+01	2.9E+00	No	NT	NT
AP-7559	T	4	4	9.5E-02	8.5E-02	No	S	S
AP-7560	T	7	7	6.9E+00	7.9E+00	No	D	S
AP-8914	S	4	4	1.5E+01	7.7E+00	No	NT	NT
TETRACHLOROETHYLENE(PCE)								
AP-10015	T	14	11	2.4E-03	9.0E-04	No	NT	NT
AP-10016	S	14	13	5.7E-03	4.3E-03	No	S	NT
AP-10017	S	14	13	8.3E-04	7.2E-04	No	NT	I
AP-10018	S	14	13	1.2E-02	1.1E-02	No	D	D
AP-7559	T	12	10	3.0E-03	3.1E-03	No	S	S
AP-7560	T	7	6	2.0E-03	1.8E-03	No	NT	S
AP-8914	S	14	11	2.4E-02	3.9E-03	No	D	D
TRICHLOROETHYLENE (TCE)								
AP-10015	T	14	14	2.0E-03	1.7E-03	No	NT	NT
AP-10016	S	14	13	9.2E-04	6.5E-04	No	PI	I
AP-10017	S	14	11	3.5E-04	3.2E-04	No	NT	I
AP-10018	S	14	13	3.3E-03	3.1E-03	No	NT	S
AP-7559	T	12	10	5.4E-04	5.2E-04	No	NT	NT
AP-7560	T	7	4	9.4E-04	9.0E-04	No	S	PD
AP-8914	S	14	12	2.4E-03	2.0E-03	No	NT	I

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); No Detectable Concentration (NDC)

The Number of Samples and Number of Detects shown above are post-consolidation values.

MAROS Summary 2—DRMO1 Spatial Moment Analysis Summary

MAROS Spatial Moment Analysis Summary

Project: DRMO1 3-Party **User Name:** FES
Location: Fort Wainwright **State:** Alaska

Effective Date	0th Moment Estimated Mass (Kg)	1st Moment (Center of Mass) Xc (ft)	Yc (ft)	Source Distance (ft)	2nd Moment (Spread) Sigma XX (sq ft)	Sigma YY (sq ft)	Number of Wells
DIESEL COMPONENTS							
9/21/2009	1.7E+00	1,394,818	3,954,947	121	2,922	1,998	7
10/11/2010	3.3E+00	1,394,846	3,954,929	87	3,352	2,112	7
9/20/2011	5.3E-01	1,394,804	3,954,963	142	2,432	1,706	7
8/31/2012	1.3E+00	1,394,812	3,954,950	126	2,674	1,944	7
8/27/2013	0.0E+00						1
10/9/2014	0.0E+00						1
8/24/2015	0.0E+00						1
TETRACHLOROETHYLENE(PCE)							
9/21/2009	8.2E-03	1,394,843	3,954,934	93	3,040	2,142	7
11/9/2009	0.0E+00						5
2/11/2010	0.0E+00						5
6/1/2010	1.1E-03	1,394,883	3,954,910	48	425	876	6
8/20/2010	1.5E-03	1,394,883	3,954,910	48	416	842	6
10/11/2010	2.4E-03	1,394,837	3,954,941	102	3,259	2,176	7
2/23/2011	8.8E-04	1,394,879	3,954,916	56	387	813	6
6/1/2011	6.2E-04	1,394,882	3,954,912	50	454	906	6
9/20/2011	3.1E-03	1,394,810	3,954,958	133	2,504	1,765	7
5/30/2012	3.0E-04	1,394,879	3,954,913	54	346	913	6
8/31/2012	2.0E-03	1,394,797	3,954,965	148	1,569	1,209	7
8/27/2013	5.8E-04	1,394,807	3,954,963	139	2,461	1,670	7
10/9/2014	4.0E-03	1,394,805	3,954,962	140	2,070	1,365	7
8/24/2015	2.6E-03	1,394,799	3,954,968	149	1,884	1,288	7
TRICHLOROETHYLENE (TCE)							
9/21/2009	8.4E-04	1,394,813	3,954,959	132	2,679	1,726	7
11/9/2009	0.0E+00						5
2/11/2010	0.0E+00						5
6/1/2010	4.3E-04	1,394,880	3,954,913	52	340	801	6
8/20/2010	6.0E-04	1,394,881	3,954,911	50	341	789	6
10/11/2010	1.8E-03	1,394,819	3,954,953	123	2,770	1,819	7
2/23/2011	3.5E-04	1,394,878	3,954,918	58	358	744	6
6/1/2011	5.2E-04	1,394,879	3,954,915	54	341	760	6
9/20/2011	1.8E-03	1,394,816	3,954,956	127	2,694	1,740	7
5/30/2012	4.7E-04	1,394,882	3,954,910	49	372	812	6
8/31/2012	2.1E-03	1,394,819	3,954,953	123	2,752	1,814	7
8/27/2013	9.0E-04	1,394,805	3,954,965	142	2,259	1,510	7
10/9/2014	1.7E-03	1,394,823	3,954,949	118	2,809	1,861	7
8/24/2015	1.0E-03	1,394,817	3,954,954	126	2,736	1,858	7

MAROS Summary 2 cont'd—DRMO1 Spatial Moment Analysis Summary

Project: DRMO1 3-Party
Location: Fort Wainwright

User Name: FES
State: Alaska

Moment Type	Constituent	Coefficient of Variation	Mann-Kendall S Statistic	Confidence in Trend	Moment Trend
Zeroth Moment: Mass					
	DIESEL COMPONENTS	1.26	-14	97.5%	D
	TETRACHLOROETHYLENE(PCE)	1.11	16	79.1%	NT
	TRICHLOROETHYLENE (TCE)	0.78	38	97.9%	I
1st Moment: Distance to Source					
	DIESEL COMPONENTS	0.19	2	62.5%	NT
	TETRACHLOROETHYLENE(PCE)	0.45	40	99.7%	I
	TRICHLOROETHYLENE (TCE)	0.40	12	77.0%	NT
2nd Moment: Sigma XX					
	DIESEL COMPONENTS	0.14	-2	62.5%	S
	TETRACHLOROETHYLENE(PCE)	0.71	0	47.3%	S
	TRICHLOROETHYLENE (TCE)	0.71	28	96.9%	I
2nd Moment: Sigma YY					
	DIESEL COMPONENTS	0.09	-2	62.5%	S
	TETRACHLOROETHYLENE(PCE)	0.38	8	68.1%	NT
	TRICHLOROETHYLENE (TCE)	0.38	24	94.2%	PI

Note: The following assumptions were applied for the calculation of the Zeroth Moment:

Porosity: 0.25 **Saturated Thickness:** Uniform: 10 ft

Mann-Kendall Trend test performed on all sample events for each constituent. Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A)-Due to insufficient Data (< 4 sampling events).

Note: The Sigma XX and Sigma YY components are estimated using the given field coordinate system and then rotated to align with the estimated groundwater flow direction. Moments are not calculated for sample events with less than 6 wells.

MAROS Summary 10 —DRMO4 Statistical Trend Analysis Summary

MAROS Statistical Trend Analysis Summary

Project: DRMO4 3-Party
User Name: FES
Location: Fort Wainwright
State: Alaska

Time Period: 9/1/2009 **to** 8/24/2015
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Average Conc. (mg/L)	Median Conc. (mg/L)	All Samples "ND" ?	Mann-Kendall Trend	Linear Regression Trend
TETRACHLOROETHYLENE(PCE)								
AP-8916	S	13	13	4.2E-03	4.0E-03	No	NT	S
PO-5	S	13	12	4.9E-03	4.0E-03	No	NT	S
Probe B	T	10	2	2.2E-04	2.5E-04	No	PI	I
TRICHLOROETHYLENE (TCE)								
AP-8916	S	13	7	6.8E-04	5.2E-04	No	PD	PD
PO-5	S	13	12	2.6E-03	3.1E-03	No	PI	NT
Probe B	T	10	4	2.0E-04	2.5E-04	No	PI	I

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); No Detectable Concentration (NDC)

The Number of Samples and Number of Detects shown above are post-consolidation values.

OU-3 Remedial Area 1B Birch Hill Tank Farm

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FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Birch Hill Tank Farm Site Map

2014 Monitoring Report
Operable Unit 3
Fort Wainwright, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-12-D-0001	2-1	6/15

NOTE:
BIRCH HILL TREATMENT SYSTEMS ARE IDENTIFIED WITH BLUE TEXT IN THE TEXT BOXES.

SOURCE:
AEROMAP U.S. APRIL 27, 2007

Groundwater Contours in the Bedrock Aquifer - November 2014

Groundwater Contours in the Alluvial Aquifer - November 2014

NOTES:

1. Coordinate System - Projection: WGS84 UTM, Zone 6N, US Survey, Feet

2. Groundwater flow direction depicted for the bedrock aquifer is generalized and based upon groundwater contours. Groundwater follows bedrock fractures and may vary across the site.

3. Groundwater flow direction depicted for the alluvial aquifer is based on groundwater contours and channels around blocks of permafrost. Recent development of the property west of the post boundary may result in thawing permafrost which could alter groundwater flow.

SOURCES:

1. Groundwater Contours were created with Surfer v.9.

2. Aerial Imagery Provided By: 2012 Fort Wainwright .SID

LEGEND:

AP-7598
429.59
Monitoring Well
Groundwater Elevation in NAVD88, Feet

429 Groundwater Elevation Contour - Measured November 3rd, 2014

Groundwater Flow Direction

Fort Wainwright Post Boundary

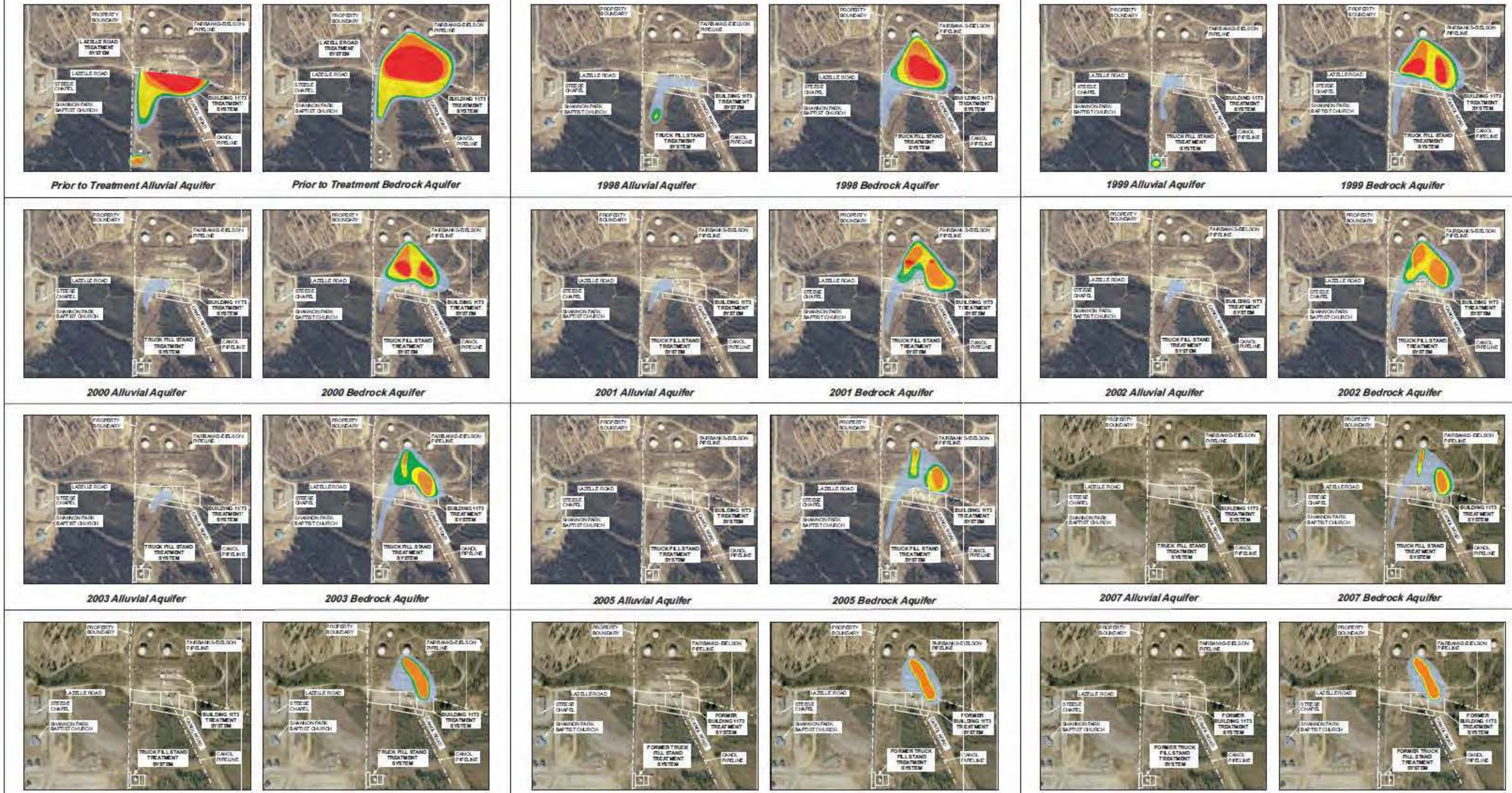
Approximate Location of Permafrost - Provided by CRREL, 2010

Fairbanks Environmental Services
3538 International Street
Fairbanks, AK 99701

Alaska District
U.S. Army Corps of Engineers
Anchorage, AK

2014 Groundwater Contours Birch Hill Tank Farm
2014 Monitoring Report
Operable Unit 3
Fort Wainwright, Alaska

Contract: W911KB-12-D-0001 | Figure: 2-2 | Date: 6/15



Prior to Treatment Alluvial Aquifer | Prior to Treatment Bedrock Aquifer | 1998 Alluvial Aquifer | 1998 Bedrock Aquifer | 1999 Alluvial Aquifer | 1999 Bedrock Aquifer

2000 Alluvial Aquifer | 2000 Bedrock Aquifer | 2001 Alluvial Aquifer | 2001 Bedrock Aquifer | 2002 Alluvial Aquifer | 2002 Bedrock Aquifer

2003 Alluvial Aquifer | 2003 Bedrock Aquifer | 2005 Alluvial Aquifer | 2005 Bedrock Aquifer | 2007 Alluvial Aquifer | 2007 Bedrock Aquifer

2011 Alluvial Aquifer | 2011 Bedrock Aquifer | 2013 Alluvial Aquifer | 2013 Bedrock Aquifer | 2014 Alluvial Aquifer | 2014 Bedrock Aquifer

NOTES:

1. HIGHEST YEARLY CONCENTRATIONS SHOWN ON MAP.
2. PREVIOUS YEARS CONTAMINANT PLUMES MODIFIED BASED ON NEW MONITORING WELL POINTS AND REEVALUATION OF PAST DATA.
3. EXTENT OF BENZENE AND PRODUCT PLUMES ON BIRCH HILL IS ESTIMATED FOR 1996-1997 BASED ON INFORMATION OBTAINED FROM WELLS INSTALLED IN 1998.
4. DRAWINGS ARE CONCEPTUAL AND ARE BASED ON EVALUATION OF AVAILABLE INFORMATION.
5. PRODUCT MEASUREMENTS LESS THAN 0.5 FOOT ARE NOT SHOWN.
6. PLUME MAPS FOR 2004, 2006, 2008, 2009, 2010 AND 2012 ARE NOT SHOWN BECAUSE OF MAP SPACE LIMITATIONS.

LEGEND

μg/L MICROGRAMS PER LITER
APPROXIMATE EXTENT OF 5 μg/L BENZENE PLUME
APPROXIMATE EXTENT OF 50 μg/L BENZENE PLUME
APPROXIMATE EXTENT OF 100 μg/L BENZENE PLUME
APPROXIMATE EXTENT OF 1,000 μg/L BENZENE PLUME
APPROXIMATE EXTENT OF PRODUCT PLUME

SOURCE: AEROMETRIC, MAY 7, 1997 AND APRIL 25, 2007

0 600 1,200
Scale in Feet

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Estimated Extent of Benzene and Free Product at the Birch Hill Tank Farm

2014 Monitoring Report
Operable Unit 3
Fort Wainwright, Alaska

CONTRACT	FIGURE	DATE
W911KB-12-D-0001	2-6	6/15

Prior to Treatment Alluvial Aquifer

Prior to Treatment Bedrock Aquifer

2000 Alluvial Aquifer

2000 Bedrock Aquifer

2001 Alluvial Aquifer

2001 Bedrock Aquifer

2002 Alluvial Aquifer

2002 Bedrock Aquifer

2003 Alluvial Aquifer

2003 Bedrock Aquifer

2004 Alluvial Aquifer

2004 Bedrock Aquifer

2005 Alluvial Aquifer

2005 Bedrock Aquifer

2006 Alluvial Aquifer

2006 Bedrock Aquifer

2008 Alluvial Aquifer

2008 Bedrock Aquifer

2011 Alluvial Aquifer

2011 Bedrock Aquifer

2013 Alluvial Aquifer

2013 Bedrock Aquifer

2014 Alluvial Aquifer

2014 Bedrock Aquifer

LEGEND

µg/L MICROGRAMS PER LITER

APPROXIMATE EXTENT OF DCA PLUME WITH CONCENTRATIONS ABOVE 5 µg/L

APPROXIMATE EXTENT OF DCA PLUME WITH CONCENTRATIONS ABOVE 50 µg/L

APPROXIMATE EXTENT OF DCA PLUME WITH CONCENTRATIONS ABOVE 100 µg/L

NOTES:

1. HIGHEST YEARLY CONCENTRATIONS SHOWN ON MAP.
2. PREVIOUS YEARS CONTAMINANT PLUMES MODIFIED BASED ON NEW MONITORING WELL POINTS AND REEVALUATION OF PAST DATA.
3. EXTENT OF DCA PLUMES ON BIRCH HILL IS ESTIMATED FOR 1996-1997 BASED ON INFORMATION OBTAINED FROM WELLS INSTALLED IN 1998.
4. DRAWINGS ARE CONCEPTUAL AND ARE BASED ON EVALUATION OF AVAILABLE INFORMATION.
5. THE PLUME MAPS FOR 2007, 2009, 2010 AND 2013 ARE NOT SHOWN DUE TO MAP SPACE LIMITATIONS. HOWEVER, ONLY MINOR CHANGES IN PLUME SHAPE WERE OBSERVED IN THESE MAPS.

SOURCE: AERO-METRIC, MAY 7, 1997 AND APRIL 25, 2007

0 600 1,200

Scale In Feet

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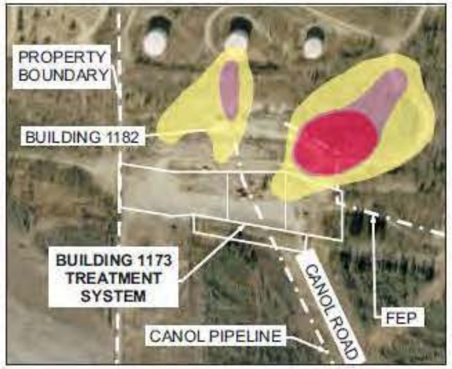
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

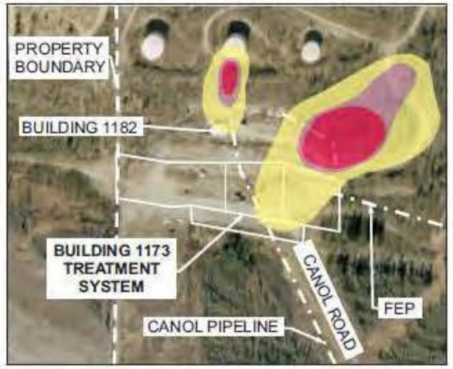
Estimated Extent of DCA at the Birch Hill Tank Farm

2014 Monitoring Report
Operable Unit 3
Fort Wainwright, Alaska

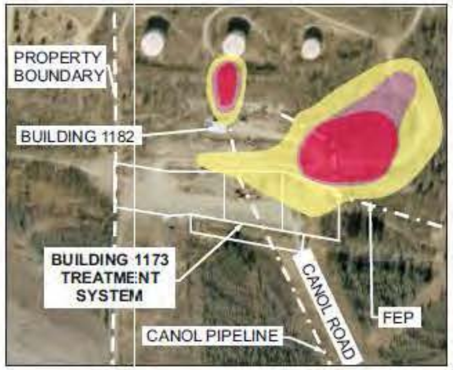
CONTRACT: W911KB-12-D-0001	FIGURE: 2-7	DATE: 6/15



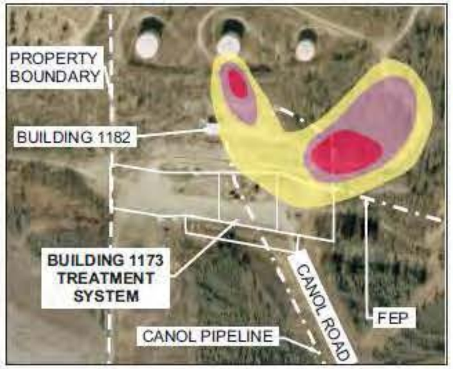
EDB Plume 2000



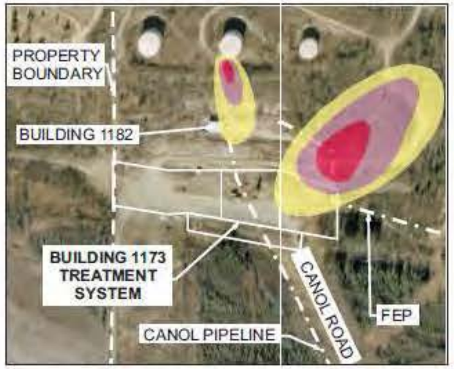
EDB Plume 2001



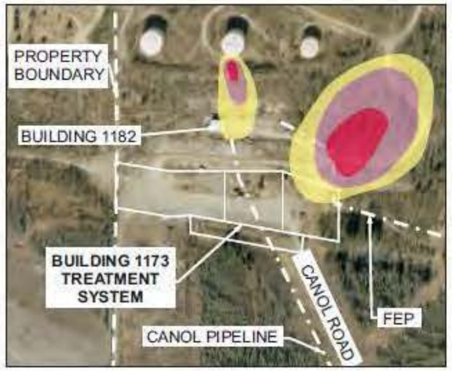
EDB Plume 2002



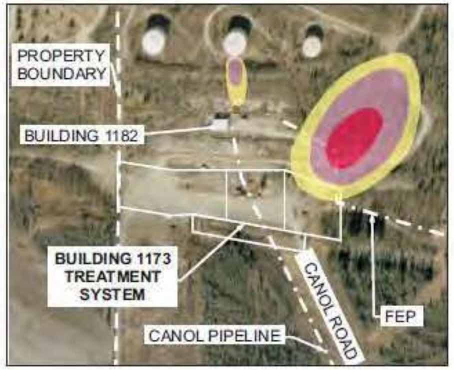
EDB Plume 2003



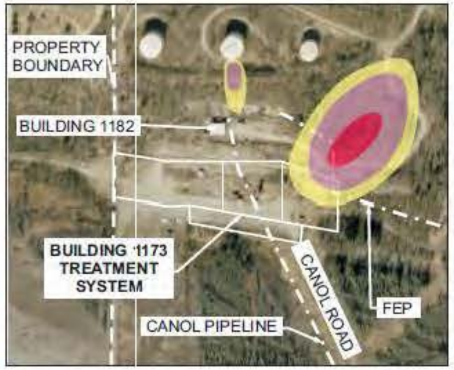
EDB Plume 2004



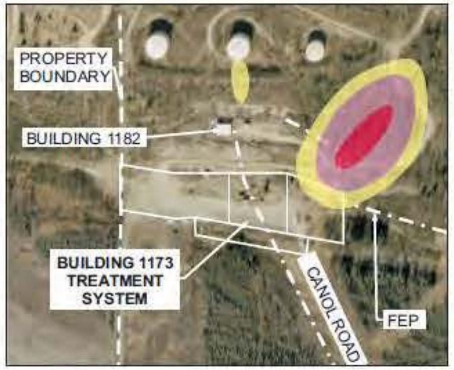
EDB Plume 2006



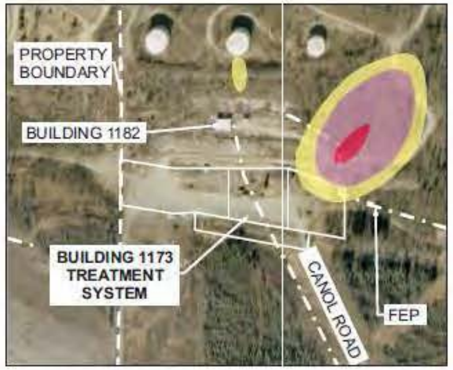
EDB Plume 2008



EDB Plume 2009



EDB Plume 2012



EDB Plume 2014

0 400 800

Scale in Feet

LEGEND:

- µg/L MICROGRAMS PER LITER
- FEP FAIRBANKS EIELSON PIPELINE
- APPROXIMATE EXTENT OF EDB PLUME ABOVE REMEDIAL ACTION GOALS OF 0.05 µg/L
- APPROXIMATE EXTENT OF EDB PLUME WITH CONCENTRATIONS ABOVE 10 µg/L
- APPROXIMATE EXTENT OF EDB PLUME WITH CONCENTRATIONS ABOVE 100 µg/L

NOTES:

1. HIGHEST YEARLY CONCENTRATIONS SHOWN ON MAP.
2. PREVIOUS YEARS CONTAMINANT PLUMES MODIFIED BASED ON NEW MONITORING WELL POINTS AND REEVALUATION OF PAST DATA.
3. PLUMES REPRESENT THE MAXIMUM CONCENTRATIONS WITHIN THE BEDROCK AQUIFERS.
4. DRAWINGS ARE CONCEPTUAL AND ARE BASED ON EVALUATION OF AVAILABLE INFORMATION.
5. EDB HAS NOT EXCEEDED THE CLEANUP GOAL IN ANY WELL IN THE ALLUVIAL AQUIFER SINCE 2005.
6. METHOD 504.1 ANALYSIS FOR EDB REPLACED METHOD 8260 ANALYSIS IN 2000. MAP PLUMES REFLECT 504.1 SAMPLES ONLY.
7. PLUME MAPS FOR 2005, 2007, 2010, 2011 AND 2013 ARE NOT SHOWN DUE TO MAP SPACE LIMITATIONS. HOWEVER, ONLY MINOR CHANGES IN PLUME SHAPE WERE OBSERVED IN THESE MAPS.

SOURCE: AERO-METRIC, MAY 7, 1997

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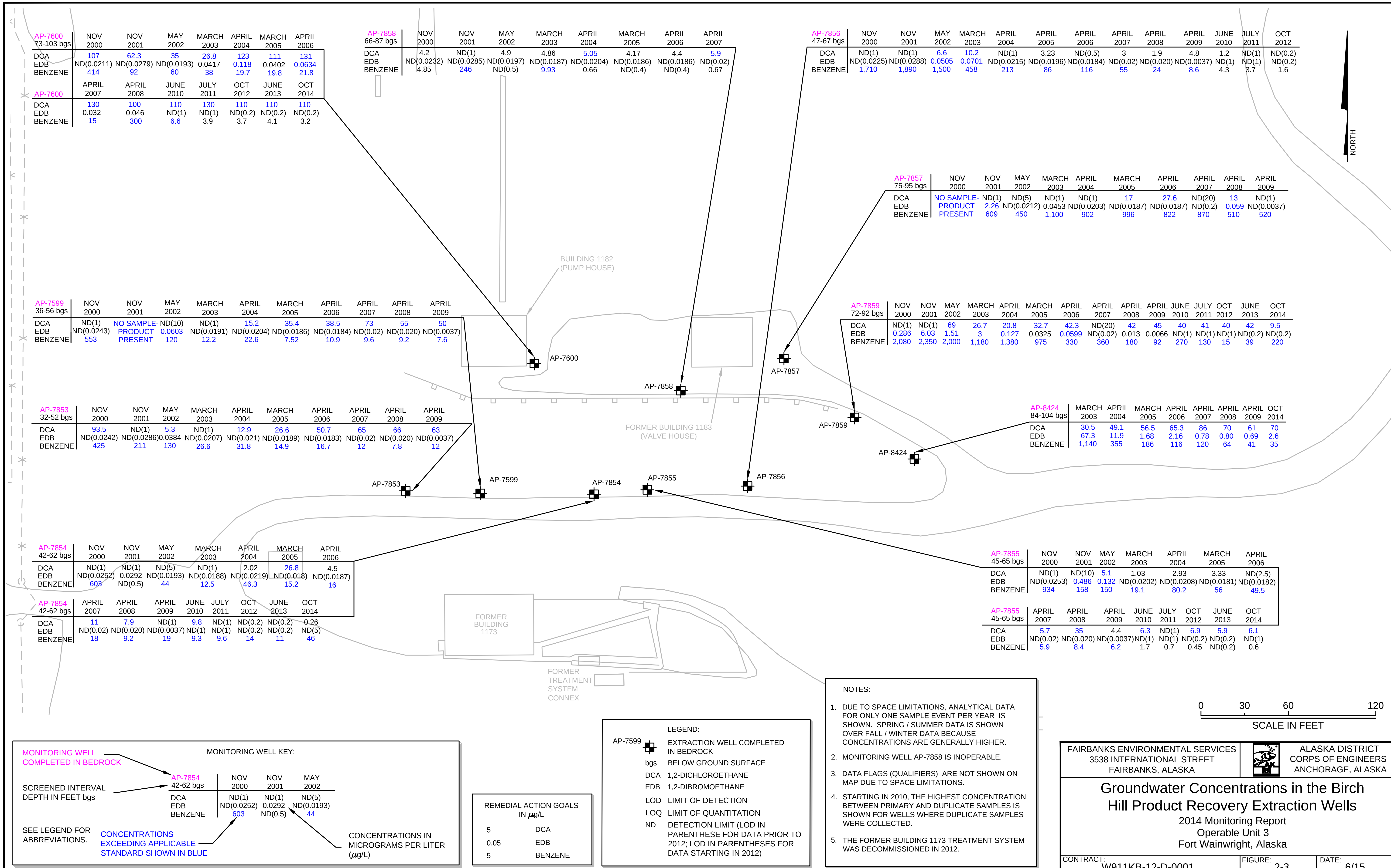
ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Estimated Extent of EDB in the Bedrock Aquifer

2014 Monitoring Report
Operable Unit 3
Fort Wainwright, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-12-D-0001	2-8	6/15



AP-7600 73-103 bgs	NOV 2000	NOV 2001	MAY 2002	MARCH 2003	APRIL 2004	MARCH 2005	APRIL 2006
DCA	107	62.3	35	26.8	123	111	131
EDB	ND(0.0211)	ND(0.0279)	ND(0.0193)	0.0417	0.118	0.0402	0.0634
BENZENE	414	92	60	38	19.7	19.8	21.8

AP-7600	APRIL 2007	APRIL 2008	JUNE 2010	JULY 2011	OCT 2012	JUNE 2013	OCT 2014
DCA	130	100	110	130	110	110	110
EDB	0.032	0.046	ND(1)	ND(1)	ND(0.2)	ND(0.2)	ND(0.2)
BENZENE	15	300	6.6	3.9	3.7	4.1	3.2

AP-7858 66-87 bgs	NOV 2000	NOV 2001	MAY 2002	MARCH 2003	APRIL 2004	MARCH 2005	APRIL 2006	APRIL 2007
DCA	4.2	ND(1)	4.9	4.86	5.05	4.17	4.4	5.9
EDB	ND(0.0232)	ND(0.0285)	ND(0.0197)	ND(0.0187)	ND(0.0204)	ND(0.0186)	ND(0.0186)	ND(0.02)
BENZENE	4.85	246	ND(0.5)	9.93	0.66	ND(0.4)	ND(0.4)	0.67

AP-7856 47-67 bgs	NOV 2000	NOV 2001	MAY 2002	MARCH 2003	APRIL 2004	APRIL 2005	APRIL 2006	APRIL 2007	APRIL 2008	APRIL 2009	JUNE 2010	JULY 2011	OCT 2012
DCA	ND(1)	ND(1)	6.6	10.2	ND(1)	3.23	ND(0.5)	3	1.9	4.8	1.2	ND(1)	ND(0.2)
EDB	ND(0.0225)	ND(0.0288)	0.0505	0.0701	ND(0.0215)	ND(0.0196)	ND(0.0184)	ND(0.02)	ND(0.020)	ND(0.0037)	ND(1)	ND(1)	ND(0.2)
BENZENE	1,710	1,890	1,500	458	213	86	116	55	24	8.6	4.3	3.7	1.6

AP-7857 75-95 bgs	NOV 2000	NOV 2001	MAY 2002	MARCH 2003	APRIL 2004	MARCH 2005	APRIL 2006	APRIL 2007	APRIL 2008	APRIL 2009
DCA	NO SAMPLE-	ND(1)	ND(5)	ND(1)	ND(1)	17	27.6	ND(20)	13	ND(1)
EDB	PRODUCT	2.26	ND(0.0212)	0.0453	ND(0.0203)	ND(0.0187)	ND(0.0187)	ND(0.2)	0.059	ND(0.0037)
BENZENE	PRESENT	609	450	1,100	902	996	822	870	510	520

AP-7599 36-56 bgs	NOV 2000	NOV 2001	MAY 2002	MARCH 2003	APRIL 2004	MARCH 2005	APRIL 2006	APRIL 2007	APRIL 2008	APRIL 2009
DCA	ND(1)	NO SAMPLE-	ND(10)	ND(1)	15.2	35.4	38.5	73	55	50
EDB	ND(0.0243)	PRODUCT	0.0603	ND(0.0191)	ND(0.0204)	ND(0.0186)	ND(0.0184)	ND(0.02)	ND(0.020)	ND(0.0037)
BENZENE	553	PRESENT	120	12.2	22.6	7.52	10.9	9.6	9.2	7.6

AP-7859 72-92 bgs	NOV 2000	NOV 2001	MAY 2002	MARCH 2003	APRIL 2004	MARCH 2005	APRIL 2006	APRIL 2007	APRIL 2008	APRIL 2009	JUNE 2010	JULY 2011	OCT 2012	JUNE 2013	OCT 2014
DCA	ND(1)	ND(1)	69	26.7	20.8	32.7	42.3	ND(20)	42	45	40	41	40	42	9.5
EDB	0.286	6.03	1.51	3	0.127	0.0325	0.0599	ND(0.02)	0.013	0.0066	ND(1)	ND(1)	ND(1)	ND(0.2)	ND(0.2)
BENZENE	2,080	2,350	2,000	1,180	1,380	975	330	360	180	92	270	130	15	39	220

AP-7853 32-52 bgs	NOV 2000	NOV 2001	MAY 2002	MARCH 2003	APRIL 2004	MARCH 2005	APRIL 2006	APRIL 2007	APRIL 2008	APRIL 2009
DCA	93.5	ND(1)	5.3	ND(1)	12.9	26.6	50.7	65	66	63
EDB	ND(0.0242)	ND(0.0286)	0.0384	ND(0.0207)	ND(0.021)	ND(0.0189)	ND(0.0183)	ND(0.02)	ND(0.020)	ND(0.0037)
BENZENE	425	211	130	26.6	31.8	14.9	16.7	12	7.8	12

AP-8424 84-104 bgs	MARCH 2003	APRIL 2004	MARCH 2005	APRIL 2006	APRIL 2007	APRIL 2008	APRIL 2009	OCT 2014
DCA	30.5	49.1	56.5	65.3	86	70	61	70
EDB	67.3	11.9	1.68	2.16	0.78	0.80	0.69	2.6
BENZENE	1,140	355	186	116	120	64	41	35

AP-7854 42-62 bgs	NOV 2000	NOV 2001	MAY 2002	MARCH 2003	APRIL 2004	MARCH 2005	APRIL 2006
DCA	ND(1)	ND(1)	ND(5)	ND(1)	2.02	26.8	4.5
EDB	ND(0.0252)	0.0292	ND(0.0193)	ND(0.0188)	ND(0.0219)	ND(0.018)	ND(0.0187)
BENZENE	603	ND(0.5)	44	12.5	46.3	15.2	16

AP-7854 42-62 bgs	APRIL 2007	APRIL 2008	APRIL 2009	JUNE 2010	JULY 2011	OCT 2012	JUNE 2013	OCT 2014
DCA	11	7.9	ND(1)	9.8	ND(1)	ND(0.2)	ND(0.2)	0.26
EDB	ND(0.02)	ND(0.020)	ND(0.0037)	ND(1)	ND(1)	ND(0.2)	ND(0.2)	ND(5)
BENZENE	18	9.2	19	9.3	9.6	14	11	46

AP-7855 45-65 bgs	NOV 2000	NOV 2001	MAY 2002	MARCH 2003	APRIL 2004	MARCH 2005	APRIL 2006
DCA	ND(1)	ND(10)	5.1	1.03	2.93	3.33	ND(2.5)
EDB	ND(0.0253)	0.486	0.132	ND(0.0202)	ND(0.0208)	ND(0.0181)	ND(0.0182)
BENZENE	934	158	150	19.1	80.2	56	49.5

AP-7855 45-65 bgs	APRIL 2007	APRIL 2008	APRIL 2009	JUNE 2010	JULY 2011	OCT 2012	JUNE 2013	OCT 2014
DCA	5.7	35	4.4	6.3	ND(1)	6.9	5.9	6.1
EDB	ND(0.02)	ND(0.020)	ND(0.0037)	ND(1)	ND(1)	ND(0.2)	ND(0.2)	ND(1)
BENZENE	5.9	8.4	6.2	1.7	0.7	0.45	ND(0.2)	0.6

MONITORING WELL KEY:

MONITORING WELL COMPLETED IN BEDROCK

SCREENED INTERVAL DEPTH IN FEET bgs

AP-7854 42-62 bgs	NOV 2000	NOV 2001	MAY 2002
DCA	ND(1)	ND(1)	ND(5)
EDB	ND(0.0252)	0.0292	ND(0.0193)
BENZENE	603	ND(0.5)	44

SEE LEGEND FOR ABBREVIATIONS.

CONCENTRATIONS EXCEEDING APPLICABLE STANDARD SHOWN IN BLUE

CONCENTRATIONS IN MICROGRAMS PER LITER (μg/L)

REMEDIAL ACTION GOALS IN μg/L

5	DCA
0.05	EDB
5	BENZENE

LEGEND:

AP-7599	EXTRACTION WELL COMPLETED IN BEDROCK
bgs	BELOW GROUND SURFACE
DCA	1,2-DICHLOROETHANE
EDB	1,2-DIBROMOETHANE
LOD	LIMIT OF DETECTION
LOQ	LIMIT OF QUANTITATION
ND	DETECTION LIMIT (LOD IN PARENTHESE FOR DATA PRIOR TO 2012; LOD IN PARENTHESES FOR DATA STARTING IN 2012)

NOTES:

1. DUE TO SPACE LIMITATIONS, ANALYTICAL DATA FOR ONLY ONE SAMPLE EVENT PER YEAR IS SHOWN. SPRING / SUMMER DATA IS SHOWN OVER FALL / WINTER DATA BECAUSE CONCENTRATIONS ARE GENERALLY HIGHER.
2. MONITORING WELL AP-7858 IS INOPERABLE.
3. DATA FLAGS (QUALIFIERS) ARE NOT SHOWN ON MAP DUE TO SPACE LIMITATIONS.
4. STARTING IN 2010, THE HIGHEST CONCENTRATION BETWEEN PRIMARY AND DUPLICATE SAMPLES IS SHOWN FOR WELLS WHERE DUPLICATE SAMPLES WERE COLLECTED.
5. THE FORMER BUILDING 1173 TREATMENT SYSTEM WAS DECOMMISSIONED IN 2012.

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Groundwater Concentrations in the Birch Hill Product Recovery Extraction Wells

2014 Monitoring Report
Operable Unit 3
Fort Wainwright, Alaska

CONTRACT: W911KB-12-D-0001 | FIGURE: 2-3 | DATE: 6/15

AP-7596 113-133 bgs	AUG-SEPT 1998	NOV-DEC 1998	MAR-APR 1999	SEPT-OCT 1999	JULY 2000	MARCH 2001	MAY 2002	MARCH 2003	APRIL 2004	MARCH 2005	APRIL 2006	APRIL 2007	APRIL 2008	MAY 2009	JUNE 2010	JULY 2011	SEPT 2012	JUNE 2013	OCT 2014
DCA	1,000	915	ND(10)	1,200	1,160	1,120	ND(50)	781	498	783	1,880	ND(100)	1,100	1,800	1,400	580	660	1,200	340
EDB	100	ND(10)	134	234	74.4	261	2.91	27.4	16.1	12.6	34.6	14	4.7	25	0.36	3.7	1.6	0.35	8.9
BENZENE	5,650	4,000	6,620	6,410	7,080	7,850	4,480	5,050	3,500	4,920	5,030	7,800	7,800	7,000	14,000	3,600	3,300	7,200	3,000
TOLUENE	885	788	1,060	1,190	1,270	2,610	274	773	683	943	3,550	2,900	2,900	5,800	6,400	880	420	3,000	650
EBZ	294	182	306	323	344	501	189	236	167	231	812	420	470	630	660	270	140	320	170
WATER ELEV.	426.72	426.12	425.90	426.44	427.75	426.69	425.94	425.36	427.12	425.54	425.91	425.66	425.29	425.65	425.49	426.38	426.85	426.06	431.02

AP-7816 20-35 bgs	NOV 1999	OCT 2000	MARCH 2001	MAY 2002	MARCH 2003	APRIL 2004	MARCH 2005	APRIL 2006	APRIL 2007	APRIL 2008	APRIL 2009	JUNE 2010	JULY 2011	SEPT 2012	JUNE 2013	OCT 2014
DCA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(0.5)	ND(0.5)	ND(1)	ND(1)	ND(1)	0.66	0.83	1.3	NOT SAMPLED DUE TO PRODUCT	0.56
EDB	ND(0.002)	ND(0.0219)	ND(0.033)	ND(0.0205)	ND(0.02)	ND(0.0208)	ND(0.0191)	ND(0.0192)	ND(0.02)	ND(0.020)	ND(1)	ND(1)	ND(1)	ND(0.2)		ND(1)
BENZENE	ND(1)	ND(1)	3.95	0.98	1.3	ND(0.5)	0.65	0.44	0.42	0.36	0.35	0.53	2.3	0.61		0.94
TOLUENE	1.52	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	0.23	ND(1)	0.18	ND(1)	ND(1)	ND(0.4)		0.07
EBZ	1.33	4.03	2.1	5.22	2.06	ND(1)	1.32	ND(1)	6	13	8.8	1.9	9.3	2.5		4.5
WATER ELEV.	NM	428.25	426.00	425.42	426.07	425.84	424.87	425.13	424.86	424.75	424.95	425.05	426.11	426.25	425.55	429.40

NOTES:

1. DUE TO SPACE LIMITATIONS, ANALYTICAL DATA FOR ONLY ONE SAMPLE EVENT PER YEAR BETWEEN 2000 AND 2012 IS SHOWN. SPRING / SUMMER DATA IS SHOWN OVER FALL / WINTER DATA BECAUSE CONCENTRATIONS ARE GENERALLY HIGHER.
2. DATA FLAGS (QUALIFIERS) ARE NOT SHOWN ON MAP DUE TO SPACE LIMITATIONS.
3. 1173 MP-1 WAS REPLACED IN NOVEMBER 2011. THE NEW AP NUMBER IS SHOWN WITH THE OLD WELL NUMBER BELOW IN PARENTHESIS.
4. STARTING IN 2010, THE HIGHEST CONCENTRATION BETWEEN PRIMARY AND DUPLICATE SAMPLES IS SHOWN FOR WELLS WHERE DUPLICATE SAMPLES WERE COLLECTED.
5. RESULTS FOR BIRCH HILL PRODUCT RECOVERY EXTRACTION WELLS ARE SHOWN ON FIGURE 2-3.
6. THE FORMER BUILDING 1173, TRUCK FILL STAND, AND THAW CHANNEL TREATMENT SYSTEMS WERE DECOMMISSIONED IN 2012.

LEGEND:

AP-8891	MULTILEVEL WELL COMPLETED IN BEDROCK
AP-7594	MONITORING WELL COMPLETED IN BEDROCK
1173-MP1	MONITORING PROBE COMPLETED IN BEDROCK
bgs	BELOW GROUND SURFACE
DCA	1,2-DICHLOROETHANE
DRO	DIESEL RANGE ORGANICS
EDB	1,2-DIBROMOETHANE
EBZ	ETHYLBENZENE
LOD	LIMIT OF DETECTION
LOQ	LIMIT OF QUANTITATION
NA	ANALYSIS NOT PERFORMED
ND	DETECTION LIMIT (LOD IN PARENTHESE FOR DATA PRIOR TO 2012; LOD IN PARENTHESES FOR DATA STARTING IN 2012)
NM	NOT MEASURED

REMEDIAL ACTION GOALS IN µg/L

5	DCA
0.05	EDB
5	BENZENE
1,000	TOLUENE
700	EBZ

ADEC GROUNDWATER CLEANUP LEVELS IN µg/L

1,500	DRO

CONCENTRATIONS OF TRIMETHYLBENZENES ARE NOT SHOWN ON MAP SINCE THE CLEANUP GOAL ESTABLISHED IN THE EXPLANATION OF SIGNIFICANT DIFFERENCES HAS NEVER BEEN EXCEEDED IN BEDROCK WELLS

0 60 120 240
SCALE IN FEET

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Groundwater Concentrations in the Bedrock Aquifer near the Birch Hill Tank Farm

2014 Monitoring Report
Operable Unit 3
Fort Wainwright, Alaska

CONTRACT: W911KB-12-D-0001 | FIGURE: 2-4 | DATE: 6/15

OPERATIONAL HISTORY:

THE GREEN BOX REPRESENTS GROUNDWATER SAMPLING EVENTS CONDUCTED AT MONITORING LOCATIONS WITHIN THE INFLUENCE OF AN TREATMENT SYSTEM ZONE

BROWN LINES REPRESENT THE TIME FRAME FOLLOWING AIR SPARGE PROBE REHABILITATION

THAW CHANNEL

1. TREATMENT SYSTEM OPERATION INITIATED IN 1999
2. TREATMENT SYSTEM MODIFIED IN 2000
3. TREATMENT SYSTEM SHUTDOWN IN 2005
4. TREATMENT SYSTEM DECOMMISSIONED IN 2012

TRUCK FILL STAND

1. TREATMENT SYSTEM OPERATION INITIATED IN 1997
2. TREATMENT SYSTEM SHUTDOWN IN 2004
3. TREATMENT SYSTEM DECOMMISSIONED IN 2012

FORMER BUILDING 1173

1. TREATMENT SYSTEM OPERATION INITIATED IN 1996
2. TREATMENT SYSTEM EXPANDED IN 1997
3. SHUTDOWN ZONES 1 AND 2 IN 2004
4. LEFT VAPOR EXTRACTION SYSTEM OFF AFTER BLOWER FAILURE IN 2005
5. SHUTDOWN ZONES 3 AND 4 IN 2005
6. TREATMENT SYSTEM SHUTDOWN IN 2005
7. TREATMENT SYSTEM DECOMMISSIONED IN 2012

NOTES:

1. DUE TO SPACE LIMITATIONS, ANALYTICAL DATA FOR ONLY ONE SAMPLE EVENT PER YEAR BETWEEN 2000 AND 2010 IS SHOWN. SPRING / SUMMER DATA IS SHOWN OVER FALL / WINTER DATA BECAUSE CONCENTRATIONS ARE GENERALLY HIGHER.
2. TREATMENT SYSTEMS WERE TURNED OFF TEMPORARILY DURING GROUNDWATER SAMPLING EVENTS.
3. GWP-33, GWP-34, GWP-45, AP-7603, GWP-2002A, GWP-100, GWP-145, GWP-121 WERE REPLACED IN NOVEMBER 2011. NEW AP NUMBERS ARE SHOWN WITH OLD WELL NUMBERS BELOW IN PARENTHESIS.
4. DATA FLAGS (QUALIFIERS) ARE NOT SHOWN ON MAP DUE TO SPACE LIMITATIONS.
5. STARTING IN 2010, THE HIGHEST CONCENTRATION BETWEEN PRIMARY AND DUPLICATE SAMPLES IS SHOWN FOR WELLS WHERE DUPLICATE SAMPLES WERE COLLECTED .
6. THE FORMER BUILDING 1173, TRUCK FILL STAND, AND THAW CHANNEL TREATMENT SYSTEMS WERE DECOMMISSIONED IN 2012.

LEGEND:

AP-6056	MONITORING WELL COMPLETED ABOVE BEDROCK
GWP34	GROUNDWATER PROBE
bgs	BELOW GROUND SURFACE
DCA	1,2-DICHLOROETHANE
DRO	DIESEL RANGE ORGANICS
EDB	1,2-DIBROMOETHANE
EBZ	ETHYLBENZENE
GRO	GASOLINE RANGE ORGANICS
LOD	LIMIT OF DETECTION
LOQ	LIMIT OF QUANTITATION
NA	ANALYSIS NOT PERFORMED
ND	DETECTION LIMIT (LOD IN PARENTHESE FOR DATA PRIOR TO 2012; LOD IN PARENTHESES FOR DATA STARTING IN 2012)
NM	NOT MEASURED

REMEDIAL ACTION GOALS IN µg/L

5	DCA
0.05	EDB
5	BENZENE
1,000	TOLUENE
700	EBZ

ADEC GROUNDWATER CLEANUP LEVELS IN µg/L

1,500	DRO
2,200	GRO

KEY:

SAMPLING POINT — GWP145 19-27 bgs

SCREENED INTERVAL DEPTH IN FEET bgs

SEE LEGEND FOR ABBREVIATIONS.

ELEVATIONS IN FEET MEAN SEA LEVEL (NGVD '29 DATUM)

GWP145 19-27 bgs	AUG 2005	APRIL 2006
DCA	ND(0.5)	ND(0.5)
EDB	0.103	ND(0.0197)
BENZENE	1.94	2.72
TOLUENE	ND(1)	ND(1)
EBZ	1.67	3.29
WATER ELEV.	427.75	424.51

CONCENTRATIONS IN MICROGRAMS PER LITER (µg/L)

CONCENTRATIONS EXCEEDING APPLICABLE STANDARD SHOWN IN BLUE

0 50 100 200

SCALE IN FEET

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Groundwater Concentrations in the Alluvial Aquifer near the Birch Hill Tank Farm

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CONTRACT: W911KB-12-D-0001 | FIGURE: 2-5 | DATE: 6/15

Table 5-10 - Groundwater Sample Results in Bedrock Monitoring Wells
Birch Hill Tank Farm

Probe/Well Number	Sample Number	Date	Water Elevation (feet msl)	Dissolved Oxygen (mg/L)	DRO (µg/L)	ROD Contaminants of Concern (µg/L)						
						Benzene	Toluene	Ethylbenzene	1,2,4-Trimethyl-benzene	1,3,5-Trimethyl-benzene	1,2-Dichloro-ethane	1,2-Dibromo-ethane[3]
CLEANUP LEVELS					**1,500**	**5**	**1,000**	**700**	**1,850**	**1,850**	**5**	**0.05**
Wells Upgradient and East of the Birch Hill Product Recovery System												
AP-7596	07FWBH16WG	4/16/2007	425.66	NA		**7,800**	**2,900**	420	78 J	43 J	ND(100)	**14**
	07FWBH60WG	9/11/2007	426.67	NA		**6,200**	**2,500**	480	120	33	**870**	**9.74**
	08FWBH23WG	4/23/2008	425.29	NA		**7800 Q**	**2900 Q**	470 Q	120 Q	33 Q	**1100 Q**	**4.7**
	08FWBH60WG	9/30/2008	428.96	NA		**4,100**	**1,300**	290	87	26	**640**	**3.1**
	09FWBH35WG	5/1/2009	425.65	NA		**7,000 QL**	**5,800 QL**	630 QL	120 QL	30 QL	**1,800 QL**	**25 QL,QH**
	10FWBH27WG	6/28/2010	425.49	NA	NA	**14,000 Q**	**6,400 Q**	660 Q	140 Q	40 Q	**1,400 Q**	**0.36 Q**
	11FW3BH30WG	7/5/2011	426.38	NA	NA	**3,600 Q**	880 Q	270 Q	60 Q	21 Q	**580 Q**	**3.7 Q**
	12FW3BHB28WG	9/27/2012	426.85	NA	NA	**3,300 Q**	420 Q	140 Q,QH	43 Q,QH	28 Q,QH	**660 Q**	**1.6 Q**
	13FW3BHB13WG	6/4/2013	426.06	NA	NA	**7,200 QH**	**3,000 QH**	320 QH	86 QH	ND(8)	**1,200 QH**	**0.35**
	14FWOU317WG	10/15/2014	431.02	0.66	NA	**3,000**	650	170	40	12 J	**340**	**8.9**
AP-7852	10FWBH22WG	6/29/2010	438.14	NA	NA	0.56 J	0.14 J, B	ND(1)	ND(1)	ND(1)	1.2	**56 J, QL**
	11FW3BH58WG	7/8/2011	437.82	0.39	NA	0.52 J	0.33 J	ND(1)	ND(1)	ND(1)	1.9	**45**
	11FW3BH59WG[2]	7/8/2011	437.82	0.39	NA	0.47 J	0.31 J	ND(1)	ND(1)	ND(1)	1.8	**50**
	12FW3BHB22WG	9/24/2012	437.28	0.86	NA	0.47 J	0.17 J	ND(0.2)	ND(0.2)	ND(0.4)	0.95 J	**82**
	13FW3BHB18WG	6/4/2013	437.52	1.16	NA	0.45 J	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.2)	**85**
	13FW3BHB49WG	9/9/2013	437.57	0.4	190 J	0.35 J	0.19 J	ND(0.2)	ND(0.2)	ND(0.4)	3.6	**58**
	14FWOU310WG	10/14/2014	438.45	1.2	NA	0.5	0.17 J	ND(0.1)	ND(0.2)	ND(0.2)	1.1	**58**
AP-7594	10FWBH18WG	6/28/2010	426.91	NA	NA	3.2 Q	0.092 J, B, Q	0.15 J, Q	0.15 J, Q	ND(1) Q	**18 Q**	**200 QL, Q**
	10FWBH19WG[2]	6/28/2010	426.91	NA	NA	3.5 Q	ND(1) Q	0.19 J, Q	0.16 J, Q	ND(1) Q	**18 Q**	**200 QL, Q**
	11FW3BH15WG	7/2/2011	427.49	0.94	NA	2.2	ND(1)	ND(1)	ND(1)	ND(1)	**15**	**160**
	11FW3BH16WG[2]	7/2/2011	427.49	0.94	NA	2.4	ND(1)	ND(1)	ND(1)	ND(1)	**14**	**170**
	12FW3BHB21WG	9/24/2012	427.87	3.98	NA	1.7	0.19 J	ND(0.2)	ND(0.2)	ND(0.4)	**12**	**150**
	13FW3BHB08WG	6/3/2013	426.88	0.66	NA	2.9	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	**14**	**160**
	14FWOU304WG	10/13/2014	431.31	0.33	NA	0.59	0.19 J	ND(0.1)	ND(0.2)	ND(0.2)	**11**	**94**
AP-7673	09FWBH05WG	4/10/2009	428.50	NA		0.95 J	ND(1)	1.7	1.5	0.86 J	0.76 J	0.016 J
	10FWBH20WG	6/28/2010	427.91	NA	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	0.63 J	0.034
	11FW3BH17WG	7/2/2011	428.36	4.07	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	0.0046 J
	12FW3BHB23WG	9/26/2012	428.97	3.73	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.2)	0.034
	13FW3BHB04WG	6/3/2013	427.94	3.85	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.0099)
	14FWOU306WG	10/14/2014	431.78	3.46	NA	ND(0.1)	0.12 J	ND(0.1)	ND(0.2)	ND(0.2)	0.13 J	ND(0.004)
	14FWOU307WG[2]	10/14/2014	431.78	3.46	NA	ND(0.1)	0.14 J	ND(0.1)	ND(0.2)	ND(0.2)	0.14 J	ND(0.004)

Table 5-10 - Groundwater Sample Results in Bedrock Monitoring Wells
Birch Hill Tank Farm

Probe/Well Number	Sample Number	Date	Water Elevation (feet msl)	Dissolved Oxygen (mg/L)	DRO (µg/L)	ROD Contaminants of Concern (µg/L) Benzene	Toluene	Ethylbenzene	1,2,4-Trimethyl-benzene	1,3,5-Trimethyl-benzene	1,2-Dichloro-ethane	1,2-Dibromo-ethane[3]
CLEANUP LEVELS					**1,500**	**5**	**1,000**	**700**	**1,850**	**1,850**	**5**	**0.05**
Wells within the Birch Hill Product Recovery System Treatment Area												
AP-7854	10FWBH33WG	6/29/2010	Extraction wells converted to monitoring wells. Wells have not been surveyed.	0.70	NA	**9.3**	0.54 J, B	95	48	40	**9.7**	ND(1)
	10FWBH34WG[2]	6/29/2010		0.70	NA	**9.1**	0.41 J, B	91	47	40	**9.8**	ND(1)
	11FW3BH62WG	7/11/2011		0.78	NA	**9.6**	0.23 J	160	38	41	ND(1)	ND(1)
	12FW3BHB44WG	10/1/2012		6.42	NA	**14 QH**	1.1 QH	190 QH	38 QH	46 QH	ND(0.2) QH	ND(0.2) QH
	13FW3BHB27WG	6/5/2013		0.29	NA	**11 QH**	0.29 J,QH	160 J,QH	25 QH	48 QH	ND(0.2)	ND(0.2)
	14FWOU305WG	10/13/2014		0.07	NA	**46**	0.47 J	140	35	19	0.26 J	ND(5.0)
AP-7855	10FWBH35WG	6/29/2010		0.82	NA	1.7	0.45 J, B	23	29	17	**6.3**	ND(1)
	11FW3BH61WG	7/11/2011		1.28	NA	0.7 J	ND(1)	16	6.6	4.6	ND(1)	ND(1)
	12FW3BHB43WG	10/1/2012		0.21	NA	0.45 J	ND(0.4)	5.1	11	6.7	**6.9**	ND(0.2)
	13FW3BHB21WG	6/5/2013		0.39	NA	ND(0.2)	ND(0.4)	0.9 J	1.6	ND(0.4)	**5.9**	ND(0.2)
	14FWOU366WG	10/18/2014		0.63	NA	0.6	ND(0.1)	6.2	2.4	1.4 J	**6.1**	ND(1.0)
AP-7856	10FWBH36WG	6/29/2010		0.78	NA	4.3	0.37 J, B	26	2.2	1.4	1.2	ND(0.02)
	11FW3BH64WG	7/11/2011		0.78	NA	3.4	ND(1)	5.8	ND(1) Q	0.63 J	1.1 Q	ND(1)
	11FW3BH65WG[2]	7/11/2011		0.78	NA	3.7	ND(1)	6.1	0.69 J	0.72 J	ND(1)	ND(1)
	12FW3BHB42WG	10/1/2012		0.17	NA	1.6 ML	0.34 J	6.6	0.87 J,ML	ND(0.2)	ND(0.2)	ND(0.2)
AP-7859	10FWBH32WG	6/29/2010	Extraction well converted to monitoring well. Well has not been surveyed.	0.55	NA	**270**	13	360	69	51	**40**	ND(1)
	11FW3BH55WG	7/7/2011		0.72	NA	**130 QH**	6.2 QH	130 QH	30 QH	25 QH	**41 QH**	ND(1)
	12FW3BHB41WG	10/1/2012		0.34	NA	**15**	3.2	51	18	20	**40**	ND(1)
	13FW3BHB05WG	6/4/2013		0.19	NA	**39 QH**	5.7 QH	88 QH	32 QH	26 QH	**42 QH**	ND(0.2)
	14FWOU367WG	10/18/2014		0.43	NA	**220 J+**	7.2 J+	130 J+	45 J+	43 J+	**9.5 J+**	ND(0.2)
AP-7600	10FWBH31WG	6/29/2010		0.70	NA	**6.6**	0.24 J, B	27	20	7	**130**	ND(1)
	11FW3BH54WG	7/7/2011		1.16	NA	3.9	ND(1)	21	13	3.9	**110**	ND(1)
	12FW3BHB40WG	10/1/2012		1.00	NA	3.7 QL	ND(0.4) QL	4.4 QL	5.8 QL	0.57 J,B,QL	**110 QL**	ND(0.2) QL
	13FW3BHB25WG	6/5/2013		0.28	NA	3.7	ND(0.4)	3.3	4.7	ND(0.4)	**110**	ND(0.2)
	13FW3BHB26WG[2]	6/5/2013		0.28	NA	4.1	ND(0.4)	3.6	4.4	ND(0.4)	**110**	ND(0.2)
	14FWOU363WG	10/17/2014		0.51	NA	3.2	0.14 J	2.6 J	11	3.5	**110**	ND(0.2)
AP-7525	10FWBH13WG	6/27/2010	425.26	1.52	NA	0.69 J	ND(1)	4.7	1	2.4	**22**	ND(1)
	10FWBH14WG[2]	6/27/2010	425.26	1.52	NA	0.66 J, QH	ND(1)	5.9 QH	1.1 QH	3 QH	**23**	ND(1)
	11FW3BH56WG	7/7/2011	426.30	2.12	NA	1.9 QH	0.21 J, QH	6.3 QH	1 QH	5.1 QH	**21 QH**	ND(1)
	12FW3BHB39WG	10/1/2012	426.23	2.53	NA	0.63 J	0.26 J	6.5	0.86 J	4.3	**16**	ND(0.2)
	13FW3BHB01WG	6/3/2013	426.01	0.23	NA	ND(0.2)	ND(0.4)	25 QH	1.1 QH	9.7 QH	**14 MH,QH**	ND(0.2)
	14FWOU301WG	10/13/2014	430.68	0.11	NA	1.8 J-	0.31 J,J-	3.9 J-	0.74 J,J-	7.9 J-	**8.8 J-**	ND(0.2) J-
AP-7848	WELL NOT SAMPLED IN 2010 DUE TO PRESENCE OF NAPL											
	11FW3BH60WG	7/8/2011	431.11	0.07	NA	**1,200**	120	**1,100**	220	170	ND(5)	ND(5)
	12FW3BHB38WG	10/1/2012	0.51	3.35	NA	**1,000**	21	**960**	170	130	ND(0.8)	ND(0.8)
	WELL NOT SAMPLED IN 2013/2014 DUE TO PRESENCE OF NAPL											

Table 5-10 - Groundwater Sample Results in Bedrock Monitoring Wells
Birch Hill Tank Farm

Probe/Well Number	Sample Number	Date	Water Elevation (feet msl)	Dissolved Oxygen (mg/L)	DRO (µg/L)	ROD Contaminants of Concern (µg/L) Benzene	Toluene	Ethylbenzene	1,2,4-Trimethyl-benzene	1,3,5-Trimethyl-benzene	1,2-Dichloro-ethane	1,2-Dibromo-ethane[3]
CLEANUP LEVELS					**1,500**	**5**	**1,000**	**700**	**1,850**	**1,850**	**5**	**0.05**
AP-7813	10FWBH24WG	6/30/2010	425.88	0.77	NA	**72**	0.48 J, B	7.1	26	17	**91**	**0.22**
	11FW3BH63WG	7/11/2011	426.87	0.8	NA	**36**	0.98 J	5.3	21	12	**74**	**0.29**
	12FW3BHB24WG	9/26/2012	427.17	0.12	NA	**29 QH**	1.3 QH	4.4 QH	19 QH	9.3 QH	**91**	**0.41 Q**
	12FW3BHB25WG[2]	9/26/2012	427.17	0.12	NA	**34 QH**	1.7 QH	5.7 QH	20 QH	10 QH	**87**	**0.35 Q**
	13FW3BHB14WG	6/4/2013	426.15	0.1	NA	**33 QH**	0.85 J,QH	3.7 QH	17 QH	11 QH	**83 QH**	**0.49**
	13FW3BHB15WG[2]	6/4/2013	426.15	0.1	NA	**29 QH**	0.81 J,QH	3.7 QH	17 QH	12 QH	**81 QH**	**0.49**
	Well not sampled in 2014 due to an obstrucion in the well. AP-8424 was sampled as a replacement.											
AP-8424	14FWOU302WG	10/13/2014	431.06	0.18	NA	**35 J**	0.36 J	2.1	4.3	4	**68 J**	**2.1**
	14FWOU303WG[2]	10/13/2014	431.06	0.18	NA	**33**	0.37	1.9	4.1	3.7	**70**	**2.6**
AP-7530	10FWBH26WG	6/30/2010	427.37	1.21	NA	**5.2**	1.1 B	90	140	75	**82**	ND(1)
	11FW3BH39WG	7/7/2011	428.51	2.16	NA	**5.2**	0.88 J	97	110	54	**67**	ND(4)
	12FW3BHB37WG	10/1/2012	426.24	2.08	NA	**5.4 Q,QH**	0.54 J,Q,QH	93 Q,QH	93 Q,QH	46 Q,QH	**67 QH**	ND(0.2)
	13FW3BHB16WG	6/4/2013	425.62	0.19	NA	4.4 QH	ND(0.4)	26 QH	27 QH	50 QH	**26 QH**	ND(0.2)
	14FWOU312WG	10/14/2014	432.73	0.47	NA	3.3 J	0.34 J	59 J	90 J	42 J	**42 J**	ND(1.0) J
Wells at the Base of Birch Hill												
AP-7595	10FWBH21WG	6/28/2010	424.87	NA	NA	0.21 J,Q	0.16 J,B,Q	29 Q	66 Q	60 Q	ND(0.2) Q	ND(0.01) Q
	WELL NOT SAMPLED IN 2011 DUE TO PRESENCE OF NAPL											
	12FW3BHB27WG	9/27/2012	426.35	0.17	NA	ND(0.8)	ND(1.6)	2.3 J	12	14	ND(0.8)	ND(0.0097)
	13FW3BHB02WG	6/3/2013	425.48	0.15	NA	ND(0.2)	ND(0.4)	0.65 J	4.8	11	ND(0.2)	ND(0.0098)
	13FW3BHB03WG[2]	6/3/2013	425.48	0.15	NA	ND(0.2)	ND(0.4)	0.68 J	5	10	ND(0.2)	ND(0.0098)
	14FWOU311WG	10/14/2014	430.48	0.85	NA	ND(0.1)	0.38 J	1.3	3.1	3.2	ND(0.2)	ND(0.004)
AP-7597	10FWBH10WG	6/25/2010	425.45	NA	NA	0.84 J,QL,Q	ND(1) QL,Q	3.3 QL,Q	3.2 QL,Q	ND(1) QL,Q	3.1 QL,Q	ND(1) QL,Q
	11FW3BH28WG	7/6/2011	426.46	6.09	NA	0.65 J	ND(1)	7	9.7	7.8	3.5	ND(1)
	12FW3BHB36WG	10/1/2012	426.53	1.86	NA	1.5	ND(0.4)	3.3	3.3	ND(0.4)	ND(0.2)	ND(0.2)
	13FW3BHB12WG	6/4/2013	425.87	2.03	NA	0.73 J	ND(0.4)	1.4	4.2	4.3	ND(0.2)	ND(0.2)
	14FWOU364WG	10/17/2014	430.64	0.23	NA	ND(0.1)	ND(0.1)	0.57	3.9	ND(0.2)	1.5	ND(0.2)
	14FWOU365WG[2]	10/17/2014	430.64	0.23	NA	ND(0.1)	ND(0.1)	0.55	3.8	ND(0.2)	1.5	ND(0.2)
AP-10226MW[1] (1173 MP-1)	10FWBH30WG	6/28/2010	425.24	3.78	NA	**3,300 QL**	860 QL	**1,300 QL**	810 QL	150 QL	**140 QL**	ND(0.01) QL
	11FW3BH66WG	7/11/2011	426.34	1.35	NA	**1,400**	440	600	420	130	ND(4)	0.031
	12FW3BHB26WG	9/27/2012	425.38	0.17	NA	**2,600**	6.1 J	81	39	16	**190**	0.043
	13FW3BHB17WG	6/4/2013	424.54	0.25	NA	**2,300**	ND(4)	36	4.5 J	7.7 J	**230**	0.039 QL
	13FW3BHB45WG	9/9/2013	424.67	0.18	**10,000**	**2,300**	5.5 B	63	30	14	**260**	0.036 QH
	13FW3BHB46WG[2]	9/9/2013	424.67	0.18	**10,000**	**2,200**	5.1 B	59	28	14	**230**	0.035 QH
	14FWOU314WG	10/14/2014	429.40	0.26	NA	**1,800**	2.8	26	13	4.8 J	**150**	0.027

Table 5-10 - Groundwater Sample Results in Bedrock Monitoring Wells
Birch Hill Tank Farm

Probe/Well Number	Sample Number	Date	Water Elevation (feet msl)	Dissolved Oxygen (mg/L)	DRO (µg/L)	ROD Contaminants of Concern (µg/L)						
						Benzene	Toluene	Ethylbenzene	1,2,4-Trimethyl-benzene	1,3,5-Trimethyl-benzene	1,2-Dichloro-ethane	1,2-Dibromo-ethane[3]
CLEANUP LEVELS					**1,500**	**5**	**1,000**	**700**	**1,850**	**1,850**	**5**	**0.05**
AP-8422	10FWBH29WG	6/28/2010	425.27	6.19	NA	**190**	50	160	170	78	**49**	ND(1)
	11FW3BH57WG	7/7/2011	426.42	0.25	NA	**73**	6.2	65	67	34	**53**	ND(1)
	12FW3BHB34WG	10/1/2012	426.37	3.28	NA	**88**	6.0	73	74	34	**44**	ND(0.2)
	12FW3BHB35WG[2]	10/1/2012	426.37	3.28	NA	**83**	6.4	70	74	37	**47**	ND(0.2)
	13FW3BHB28WG	6/5/2013	425.72	0.23	NA	**85**	3.9 J	56	53	37	**56**	ND(0.8)
	13FW3BHB47WG	9/9/2013	425.87	0.12	**5,800**	**140**	3.8 B	64	73	34	**55**	ND(0.0099)
	14FWOU368WG	10/18/2014	430.52	0.3	NA	**49**	3.2	36	60	34	**41**	ND(1.0)
AP-7816	09FWBH14WG	4/13/2009	424.95	0.41		0.35 J,B	0.18 J	8.8	28	22	ND(1)	ND(1)
	10FWBH11WG	6/25/2010	425.05	0.19	NA	0.53 J, QL	ND(1) QL	1.9 QL	7.1 QL	5.3 QL	0.66 J,QL	ND(1) QL
	11FW3BH11WG	7/1/2011	426.11	0.69	NA	2.3	ND(1)	9.3	10	6.6	0.83 J	ND(1)
	12FW3BHB33WG	9/28/2012	426.25	0.22	NA	0.61 J	ND(0.4)	2.5	14	13	1.3	ND(0.2)
	WELL NOT SAMPLED IN 2013 DUE TO PRESENCE OF NAPL											
	14FWOU369WG	10/18/2014	429.41	0.16	NA	0.94	0.07 J,B	4.5	20	19	0.56	ND(1.0)
AP-6071	10FWBH01WG	6/25/2010	425.03	1.74	NA	0.99 J	ND(1)	0.15 J, B	ND(1)	ND(1)	ND(1)	ND(1)
	11FW3BH33WG	7/7/2011	425.89	1.24	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
	12FW3BHB32WG	9/28/2012	426.14	0.58	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)
	13FW3BHB09WG	6/4/2013	425.23	7.55	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)
	Well was destroyed by heavy equipment during Lazelle Road realignment.											
Wells Along CANOL, in the Thaw Channel, or Off-Post												
AP-6560	10FWBH15WG	6/27/2010	424.97	0.62	NA	0.13 J	ND(1)	0.066 J,B	0.063 J	ND(1)	1.1	ND(1)
	11FW3BH13WG	7/1/2011	425.89	1.31	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	1.2	ND(1)
	12FW3BHB01WG	9/24/2012	426.08	0.31	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	1.2	ND(0.2)
	13FW3BHB23WG	6/5/2013	425.59	0.4	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	1.2	ND(0.2)
	14FWOU362WG	10/17/2014	429.98	0.42	NA	ND(0.1)	0.06 J	ND(0.1)	ND(0.2)	ND(0.2)	0.31 J	ND(0.2)
AP-9181	10FWBH16WG	6/27/2010	424.94	0.85	NA	0.22 J	0.78 J	0.41 J	4.2	1.9	1	ND(1)
	11FW3BH12WG	7/1/2011	425.85	1.81	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	1	ND(1)
	12FW3BHB31WG	9/27/2012	426.10	0.91	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	1.1	ND(0.2)
	13FW3BHB24WG	6/5/2013	425.62	0.45	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	0.90 J	ND(0.2)
	14FWOU361WG	10/17/2014	430.05	0.35	NA	ND(0.1)	0.07 J	ND(0.1)	ND(0.2)	ND(0.2)	1.2	ND(0.2)
AP-7730	11FW3BH14WG	7/1/2011	425.32	1.22	NA	0.54 J	ND(1)	ND(1)	ND(1)	ND(1)	1.1	ND(0.02)
	12FW3BHB02WG	9/24/2012	426.09	0.1	NA	0.54 J	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	1.3	ND(0.010)
	12FW3BHB03WG[2]	9/24/2012	426.09	0.1	NA	0.53 J	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	1.3	ND(0.0097)
	13FW3BHB10WG	6/4/2013	425.52	1.93	NA	0.60 J	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	1.5	ND(0.0099)
	14FWOU313WG	10/14/2014	430.02	0.31	NA	0.52	0.14 J	ND(0.1)	0.12 J	ND(0.2)	1.6	ND(0.004)
AP-7846	10FWBH12WG	6/25/2010	424.93	0.47	NA	0.92 J	ND(1)	ND(1)	ND(1)	ND(1)	0.45 J	ND(1)
	11FW3BH02WG	6/29/2011	425.88	2.83	NA	0.32 J	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
	12FW3BHB29WG	9/27/2012	426.07	0.54	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	0.62 J	ND(0.2)
	13FW3BHB11WG	6/4/2013	425.51	1.39	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)
	14FWOU332WG	10/15/2014	429.92	0.4	NA	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.2)	ND(0.2)	0.78	ND(0.2)

Table 5-10- Groundwater Sample Results in Bedrock Monitoring Wells
Birch Hill Tank Farm

Probe/Well Number	Sample Number	Date	Water Elevation (feet msl)	Dissolved Oxygen (mg/L)	DRO (µg/L)	ROD Contaminants of Concern (µg/L)						
						Benzene	Toluene	Ethylbenzene	1,2,4-Trimethyl-benzene	1,3,5-Trimethyl-benzene	1,2-Dichloro-ethane	1,2-Dibromo-ethane[3]
CLEANUP LEVELS					**1,500**	**5**	**1,000**	**700**	**1,850**	**1,850**	**5**	**0.05**
AP-7598	10FWTH12WG	6/22/2010	425.00	0.49	NA	ND(1)	0.11 J	ND(1)	0.13 J	ND(1)	1.8	ND(0.01) QL
	11FW3BH25WG	7/5/2011	426.02	0.98	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	1.5	ND(1)
	12FW3BHB04WG	9/24/2012	426.06	0.23	360	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	1.3	ND(0.2)
	13FW3BHB41WG	6/10/2013	425.77	0.39	560	ND(0.2)	0.57 J	ND(0.2)	ND(0.2)	ND(0.4)	1.3	ND(0.2)
	14FWOU347WG	10/15/2014	429.88	0.56	350 J-	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.2)	ND(0.2)	1.2	ND(0.2)
AP-9957	10FWTH04WG	2/10/2010	424.48	1.41	NA	ND(1)	ND(1)	0.15 J	ND(1)	ND(1)	0.62 J	ND(0.02)
	10FWTH08WG	6/22/2010	424.77	0.18	NA	ND(1)	0.12 J, Q	ND(1)	0.060 J	ND(1)	ND(1) Q	ND(0.01) QL
	10FWTH13WG[2]	6/22/2010	424.77	0.18	NA	ND(1)	0.19 J	ND(1)	ND(1)	ND(1)	0.71 J	ND(0.01) QL
	10FWTH30WG	8/17/2010	425.28	0.11	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	0.61 J	ND(0.10)
	10FWTH35WG	11/9/2010	424.89	0.65	NA	ND(1)	ND(1)	0.11 J,QH	ND(1)	ND(1)	0.76 J, QH	ND(0.021)
	11FW3BH06WG	6/30/2011	425.68	0.86	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(0.02)
	11FW3BH08WG[2]	6/30/2011	425.68	0.86	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(0.02)
	12FW3BHB06WG	9/25/2012	425.87	0.19	180 J	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	0.84 J	ND(0.2)
	12FW3BHB07WG[2]	9/25/2012	425.87	0.19	180 J	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	0.83 J	ND(0.2)
	13FW3BHB42WG	6/11/2013	425.68	1.70	300	ND(0.2)	0.21 J	ND(0.2)	ND(0.2)	ND(0.4)	0.63 J	ND(0.2)
	14FWOU346WG	10/15/2014	429.80	0.44	180 J,J-	ND(0.1)	0.11 J	ND(0.1)	ND(0.2)	ND(0.2)	0.73 J	ND(0.2)
AP-9959	10FWTH02WG	2/10/2010	425.31	0.88	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	0.75 J	ND(0.02)
	10FWTH03WG[2]	2/10/2010	425.31	0.88	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	0.72 J	ND(0.02)
	10FWTH07WG	6/22/2010	425.52	0.28	NA	ND(1)	0.18 J	ND(1)	ND(1)	ND(1)	0.78 J	ND(0.01) QL
	10FWTH27WG	8/17/2010	426.25	0.11	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	0.81 J	ND(0.02)
	10FWTH28WG[2]	8/17/2010	426.25	0.11	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	0.75 J	ND(0.019)
	10FWTH33WG	11/9/2010	425.69	0.61	NA	ND(1)	ND(1) B,QH	ND(1)	ND(1)	ND(1)	0.61 J,QH	ND(0.20)
	11FW3BH04WG	6/30/2011	426.55	1.26	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	0.72 J	ND(0.02)
	12FW3BHB05WG	9/25/2012	426.64	0.29	260	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	0.91 J	ND(0.2)
	13FW3BHB43WG	6/11/2013	426.48	1.51	390	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	0.72 J	ND(0.2)
	13FW3BHB44WG[2]	6/11/2013	426.48	1.51	370	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	0.69 J	ND(0.2)
	14FWOU341WG	10/15/2014	430.25	0.33	220 J,J-	ND(0.1)	0.06 J	ND(0.1)	ND(0.2)	ND(0.2)	0.62	ND(0.2)
	14FWOU342WG[2]	10/15/2014	430.25	0.33	200 J,J-	ND(0.1)	0.07 J	ND(0.1)	ND(0.2)	ND(0.2)	0.60	ND(0.2)

Bold results represent concentrations in excess of remedial action goals

[1] Replacement wells installed in November 2011. Wells that were replaced are shown in parentheses.

[2] Denotes sample is a field duplicate of preceding row.

[3] 1,2-Dibromoethane results were generated from either Method 8260 or Method 504.1. Results from Method 504.1 were used when available.

ND - not detected at the detection limit (LOQ in parentheses for data prior to 2012. LOD in parentheses for data staring in 2012.)

DRO - diesel range organics
LOD - limit of detection
LOQ - limit of quantitation
µg/L - micrograms per liter
mg/L - milligram per liter
msl - mean sea level
NA - not analyzed
NM - not measured
ROD - Record of Decision

Table 5-11 - Groundwater Sampling Results in Multi-Level Monitoring Wells (Bedrock)
Birch Hill Tank Farm

Probe/Well Number	Port Number	Port Elevation (feet msl)	Sample Number	Date	Dissolved Oxygen (mg/L)	Iron II (mg/L)	Sulfate (mg/L)	DRO (µg/L)	ROD Contaminants of Concern (µg/L) Benzene	Toluene	Ethyl benzene	1,2,4-Trimethyl-benzene	1,3,5-Trimethyl-benzene	1,2-Dichloroethane	1,2-Dibromoethane[2]
CLEANUP LEVELS								**1,500**	**5**	**1,000**	**700**	**1,850**	**1,850**	**5**	**0.05**
Wells on Birch Hill															
AP-8783	Port 5	399.9	08FWBH22WG	4/23/2008	2.01	0	7.7		ND(1)	0.13 J,B	0.13 J	ND(1)	0.14 J	ND(1)	0.012 J
			08FWBH48WG	9/25/2008	0.89	0	10.8		ND(1)	0.10 J,B	ND(1)	ND(1)	ND(1)	ND(1)	0.015 J
			09FWBH27WG	4/15/2009	0.30	0	23.1		0.35 J	0.43 J	0.13 J	ND(1)	ND(1)	ND(1)	0.0065 J
			13FW3BHB06WG	6/4/2013	0.45	NA	NA		ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.0099)
			14FWOU316WG	10/15/2014	0.39	NA	NA		ND(0.1)	0.09 J	ND(0.1)	ND(0.2)	ND(0.2)	ND(0.15)	0.016
	Port 6	420.4	08FWBH49WG	9/25/2008	2.06	31	0		**420 QH**	22 QH	15 QH	100 QH	8.3 QH	**300 QH**	**0.91 QH**
			09FWBH28WG	4/15/2009	1.19	26.8	31.1		**3,400 QL**	**2,700 QL**	340	160	ND(1)	**690**	0.031
			10FWBH28WG	6/28/2010	1.21	21.6	<8.0	NA	**300 Q**	5.5 Q	8.6 Q	110 Q	9.3 Q	**230 Q**	**0.19 Q**
			11FW3BH31WG	7/5/2011	0.94	NA	NA	NA	**3,300**	210	170	100	12 J	**610**	**0.061**
			12FW3BHB08WG	9/24/2012	0.40	NA	NA	NA	**3,300**	510	160	76	10 J	**520**	ND(0.0097)
			13FW3BHB07WG	6/4/2013	0.78	NA	NA	NA	**4,000 QH**	530 QH	220 QH	80 QH	12 QH	**720 QH**	**0.45**
			14FWOU315WG	10/15/2014	0.51	NA	NA	NA	**1,500**	170	38	22	2.7 J	**210**	**0.43**
Wells on Birch Hill															
AP-8890	Port 5		13FW3BHB19WG	6/5/2013	1.18	NA	NA	NA	ND(0.2)	0.24 J	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.0099)
			14FWOU308WG	10/14/2014	1.52	NA	NA	NA	ND(0.1)	0.24 J	ND(0.1)	ND(0.2)	ND(0.2)	0.09 J	ND(0.004)
	Port 6	423.00	07FWBH50WG	9/10/2007	5.29	0	4.2		ND(1)	0.12 J	ND(1)	ND(1)	ND(1)	**27**	**22**
			08FWBH21WG	4/23/2008	NM	0	5		ND(1)	ND(1)	0.15 J	0.087 J	0.16 J	**31**	**11**
			08FWBH47WG	9/25/2008	NM	0	8.6		1	0.22 J,B	3	2.8	2	**21**	**14**
			09FWBH26WG	4/15/2009	NM	0	42		ND(1)	0.37 J	ND(1)	ND(1)	ND(1)	**27**	**15**
			10FWBH17WG	6/27/2010	3.02	<0.45	10.8	NA	0.17 J,Q	1.0 Q	0.15 J,Q	ND(1) Q	ND(1) Q	**33 Q**	**14 Q**
			11FW3BH29WG	7/6/2011	0.94	NA	NA	NA	ND(1) Q	ND(1) Q	ND(1) Q	ND(1) Q	ND(1) Q	**31 Q**	**12 Q**
			12FW3BHB09WG	9/24/2012	3.74	NA	NA	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	**32**	**9.4**
			13FW3BHB20WG	6/5/2013	3.78	NA	NA	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	**31**	**11**
			14FWOU309WG	10/14/2014	3.33	NA	NA	NA	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.2)	ND(0.2)	**23**	**4.1**
Wells at the Base of Birch Hill															
AP-8784	Port 1	303.00	10FWBH02WG	6/25/2010	0.12	<0.45	33.7	NA	0.46 J	ND(1)	0.11 J,B	ND(1)	ND(1)	2.6	ND(1)
			11FW3BH47WG	7/7/2011	2.31	NA	NA	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	2	ND(1)
			12FW3BHB15WG	9/25/2012	0.14	NA	NA	ND(67)	ND(0.2)	0.17 J	ND(0.2)	ND(0.2)	ND(0.4)	1.9	ND(0.2)
			13FW3BHB30WG	6/6/2013	0.14	NA	NA	ND(67)	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	1.5	ND(0.2)
			14FWOU349WG	10/16/2014	0.27	NA	NA	43 J,J-,B	ND(0.1)	0.14 J	ND(0.1)	ND(0.2)	ND(0.2)	2.3	ND(0.2)
	Port 2	312.50	10FWBH03WG	6/25/2010	0.10	<0.45	32.1	NA	ND(1)	ND(1)	0.072 J,B	ND(1)	ND(1)	3.7	ND(1)
			11FW3BH48WG	7/7/2011	3.94	NA	NA	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	3.4	ND(1)
			12FW3BHB06WG	9/25/2012	0.83	NA	NA	ND(68)	ND(0.2)	0.36 J	0.17 J	ND(0.2)	ND(0.4)	2.6	ND(0.2)
			13FW3BHB31WG	6/5/2013	0.21	NA	NA	74 J	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	2.9	ND(0.2)
			14FWOU350WG	10/16/2014	0.39	NA	NA	42 J,J-,B	ND(0.1)	0.17 J	ND(0.1)	ND(0.2)	ND(0.2)	3.1	ND(0.2)
	Port 3	325.00	10FWBH04WG	6/25/2010	0.23	<0.45	30.6	NA	0.21 J	ND(1)	0.12 J, B	ND(1)	ND(1)	3.3	ND(1)
			11FW3BH49WG	7/7/2011	0.81	NA	NA	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	3.4	ND(1)
			12FW3BHB17WG	9/25/2012	0.41	NA	NA	ND(70)	ND(0.2)	ND(0.4)	0.22 J	ND(0.2)	ND(0.4)	3.9	ND(0.2)
			13FW3BHB32WG	6/5/2013	0.40	NA	NA	41 J	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	3.1	ND(0.2)
			14FWOU351WG	10/16/2014	0.27	NA	NA	38 J,J-,B	ND(0.1)	0.09 J	ND(0.1)	ND(0.2)	ND(0.2)	3.6	ND(0.2)
	Port 4	337.50	10FWBH05WG	6/25/2010	0.48	<0.45	31.2	NA	0.080 J, QL	ND(1) QL	0.069 J,B,QL	0.058 J,QL	ND(1) QL	2.3 QL	ND(1) QL
			11FW3BH50WG	7/7/2011	6.39	NA	NA	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	2.5	ND(1)
			12FW3BHB18WG	9/25/2012	0.92	NA	NA	ND(68)	ND(0.2)	ND(0.4)	0.19 J	ND(0.2)	ND(0.4)	2.4	ND(0.2)
			13FW3BHB33WG	6/5/2013	0.58	NA	NA	35 J	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	3.4	ND(0.2)
			14FWOU352WG	10/16/2014	0.95	NA	NA	51 J,J-,B	0.08 J	0.06 J	ND(0.1)	ND(0.2)	ND(0.2)	3.4	ND(0.2)
	Port 5	352.00	10FWBH06WG	6/25/2010	0.18	<0.45	27.9	NA	0.14 J	ND(1)	0.11 J, B	ND(1)	ND(1)	4	ND(1)
			11FW3BH51WG	7/7/2011	2.08	NA	NA	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	4.1	ND(1)
			12FW3BHB19WG	9/25/2012	0.29	NA	NA	ND(68)	ND(0.2)	ND(0.4)	0.22 J	ND(0.2)	ND(0.4)	3.8	ND(0.2)
			13FW3BHB34WG	6/5/2013	0.16	NA	NA	59 J	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	3.9	ND(0.2)
			14FWOU353WG	10/16/2014	0.30	NA	NA	47 J,J-,B	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.2)	ND(0.2)	4.9	ND(0.2)

Table 5-11 - Groundwater Sampling Results in Multi-Level Monitoring Wells (Bedrock)
Birch Hill Tank Farm

Probe/Well Number	Port Number	Port Elevation (feet msl)	Sample Number	Date	Dissolved Oxygen (mg/L)	Iron II (mg/L)	Sulfate (mg/L)	DRO (µg/L)	ROD Contaminants of Concern (µg/L) Benzene	Toluene	Ethyl benzene	1,2,4-Trimethyl-benzene	1,3,5-Trimethyl-benzene	1,2-Dichloroethane	1,2-Dibromoethane[2]
CLEANUP LEVELS								**1,500**	**5**	**1,000**	**700**	**1,850**	**1,850**	**5**	**0.05**
AP-8784 (Continued)	Port 6	369.50	10FWBH07WG	6/25/2010	0.03	9.7	25	NA	0.53 J,QL	ND(1) QL	0.11 J,B,QL	0.094 J,QL	ND(1) QL	3.6 QL	ND(1) QL
			10FWBH08WG[1]	6/25/2010	0.03	NA	NA	NA	0.59 J	ND(1)	0.1 J, B	ND(1)	ND(1)	3.7	ND(1)
			11FW3BH52WG	7/7/2011	9.33	NA	NA	NA	0.31 J	ND(1)	ND(1)	ND(1)	ND(1)	3.8	ND(1)
			11FW3BH53WG[1]	7/7/2011	9.33	NA	NA	NA	0.31 J	ND(1)	ND(1)	ND(1)	ND(1)	3.9	ND(1)
			12FW3BHB20WG	9/25/2012	0.85	NA	NA	ND(69)	0.21 J	ND(0.4)	0.22 J	ND(0.2)	ND(0.4)	3.5	ND(0.2)
			13FW3BHB35WG	6/5/2013	0.50	NA	NA	82 J	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	4	ND(0.2)
			14FWOU354WG	10/16/2014	0.19	NA	NA	43 J,J-,B	0.07 J	ND(0.1)	ND(0.1)	ND(0.2)	ND(0.2)	4.7	ND(0.2)
Wells at the Thaw Channel															
AP-8891	Port 1	312.50	10FWTH20WG	6/24/2010	0.20	NA	NA	NA	1.9	0.19 J	0.079 J	ND(1)	ND(1)	ND(1)	ND(0.01) QL
			11FW3BH40WG	7/6/2011	0.36	NA	NA	NA	1.3	0.22 J	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
			12FW3BHB10WG	9/24/2012	0.21	NA	NA	500	1.5	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)
			14FWOU355WG	10/16/2014	0.18	NA	NA	360 J,J-	0.97	0.07 J	ND(0.1)	ND(0.2)	ND(0.2)	ND(0.15)	ND(0.2)
	Port 2	318.00	10FWTH21WG	6/24/2010	0.25	NA	NA	NA	1.8	ND(1)	0.088 J	0.11 J	ND(1)	ND(1)	ND(0.01) QL
			11FW3BH41WG	7/6/2011	0.95	NA	NA	NA	1.5	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
			13FW3BHB36WG	6/10/2013	0.25	NA	NA	570 J-	1.4	0.21 J	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)
	Port 3	326.50	10FWTH22WG	6/24/2010	0.21	NA	NA	NA	0.53 J	0.13 J	0.25 J	0.074 J	ND(1)	ND(1)	ND(0.01) QL
			11FW3BH42WG	7/6/2011	0.19	NA	NA	NA	0.44 J	0.38 J	0.23 J	ND(1)	ND(1)	ND(1)	ND(1)
			12FW3BHB11WG	9/24/2012	0.39	NA	NA	290	0.30 J	ND(0.4)	0.17 J	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)
			13FW3BHB37WG	6/10/2013	0.12	NA	NA	420	0.22 J	0.38 J	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)
			14FWOU356WG	10/16/2014	0.19	NA	NA	140 J,J-	0.07 J	0.06 J	ND(0.1)	ND(0.2)	ND(0.2)	ND(0.15)	ND(0.2)
	Port 4	337.00	10FWTH23WG	6/24/2010	0.30	NA	NA	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(0.01) QL
			11FW3BH43WG	7/6/2011	0.16	NA	NA	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
			12FW3BHB12WG	9/24/2012	0.45	NA	NA	70 J	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)
			13FW3BHB38WG	6/10/2013	0.14	NA	NA	130 J	ND(0.2)	0.21 J	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)
			14FWOU357WG	10/16/2014	0.20	NA	NA	57 J,J-	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.2)	ND(0.2)	ND(0.15)	ND(0.2)
	Port 5	347.50	10FWTH24WG	6/24/2010	0.17	NA	NA	NA	0.067 J, B	ND(1)	ND(1)	ND(1)	ND(1)	0.26 J	ND(0.01) QL
			11FW3BH44WG	7/6/2011	4.62	NA	NA	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
			12FW3BHB13WG	9/24/2012	0.28	NA	NA	150 J	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	0.35 J	ND(0.2)
			13FW3BHB39WG	6/10/2013	0.08	NA	NA	250	ND(0.2)	0.23 J	ND(0.2)	ND(0.2)	ND(0.4)	0.36 J	ND(0.2)
			14FWOU258WG	10/16/2014	0.13	NA	NA	93 J,J-	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.2)	ND(0.2)	0.14 J	ND(0.2)
	Port 6	374.00	10FWTH25WG	6/24/2010	0.32	NA	NA	NA	ND(1)	0.10 J	ND(1)	0.098 J	0.054 J	2	ND(0.01) QL
			11FW3BH45WG	7/6/2011	0.24	NA	NA	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	1.8	ND(1)
			11FW3BH46WG[1]	7/6/2011	0.24	NA	NA	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	1.8	ND(1)
			12FW3BHB14WG	9/24/2012	0.44	NA	NA	680	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	1.6	ND(0.2)
			13FW3BHB40WG	6/10/2013	0.11	NA	NA	980	ND(0.2)	0.18 J	ND(0.2)	ND(0.2)	ND(0.4)	2.2	ND(0.2)
			14FWOU359WG	10/16/2014	0.09	NA	NA	510 J,J-	ND(0.1)	ND(0.1)	ND(0.1)	0.07 J	ND(0.2)	1.8	ND(0.2)

Bold results represent concentrations in excess of remedial action goals
[1] Denotes sample is a field duplicate of preceding row.
[2] 1,2-Dibromoethane results were generated from either Method 8260 or Method 504.1. Results from Method 504.1 were used when available.

DRO - diesel range organics
LOD - limit of detection
LOQ - limit of quantitation
µg/L - micrograms per liter
mg/L - milligram per liter

msl - mean sea level
NA - not analyzed
NM - not measured
ROD - Record of Decision

Data Qualifiers
B - analyte was detected in blank sample at similar concentration
J - result is estimated because it is less than the LOQ or due to a QC failure
J- or J+ - result is estimated with a high (+) or low (-) bias due to a QC failure (data starting in 2014)
ML or MH - result is estimated with a high (H) or low (L) bias due to matrix interference (data prior to 2014)
ND - not detected at the detection limit (LOQ in parentheses for data prior to 2012. LOD in parentheses for data staring in 2012.)
Q - result is estimated and biased (H-high/L-low) due to quality control failure (data prior to 2014)

Table 5-12 - Groundwater Sample Results in Alluvial Monitoring Wells
Birch Hill Tank Farm

Probe/Well Number	Sample Number	Date	Water Elevation (feet msl)	Dissolved Oxygen (mg/L)	Iron II (mg/L)	Sulfate (mg/L)	DRO	GRO	ROD Contaminants of Concern (µg/L)						
									Benzene	Toluene	Ethylbenzene	1,2,4-Trimethyl-benzene	1,3,5-Trimethyl-benzene	1,2-Dichloro-ethane	1,2-Dibromo-ethane[3]
CLEANUP LEVELS							**1,500**	**2,200**	**5**	**1,000**	**700**	**1,850**	**1,850**	**5**	**0.05**
Building 1173 (Base of Birch Hill)															
AP-10227MW[1] (AP-7603)	10FWA03WG	6/24/2010	424.94	1.35	10	230 J	**13,000**	610	0.42 J	ND(1)	38 J, MH	32 J, MH	9.4	**6.3**	ND(0.01)
	11FW3BH35WG	7/6/2011	426.19	0.62	18	70	**22,000**	400	ND(1)	0.23 J	7.1	5	4.3	2.5	ND(1)
	11FW3BH86WG	11/14/2011	426.81	0.54	2.8	6.7	**6,700**	**2,800**	NA	NA	NA	NA	NA	NA	NA
	12FW3BHA13WG	9/27/2012	426.54	0.47	13	6.1	**3,200**	1,400	ND(0.2)	0.33 J,QH	53 QH	190 ML,QH	110 ML,QH	**15 QH**	ND(0.2) QH
	13FW3BHA03WG	6/10/2013	425.88	0.2	10	3.8 J	**3,300**	950	ND(0.2)	ND(0.4)	11	140	85	**23**	ND(0.2)
	13FW3BHA04WG[2]	6/10/2013	425.88	0.2	10	3.7 J	**3,200**	960	ND(0.2)	ND(0.4)	9.9	130	83	**23**	ND(0.2)
	13FW3BHA23WG	9/5/2013	425.84	0.23	NM	NM	**3,100**	NA	ND(0.2)	ND(0.4)	9	120	77	**17**	ND(0.010)
	14FWOU321WG	10/13/2014	430.61	0.38	19.1 J-	423	**6,000**	910	0.45 J	0.12 J	1.9 J	34	23	3.1	ND(1.0)
AP-10231MW[1] (GWP-2002A)	WELL NOT SAMPLED IN JUNE 2011 DUE TO POOR RECHARCGE														
	11FW3BH85WG	11/14/2011	427.03	0.38	0.084	3.2 ML	**3,200 ML**	84	NA	NA	NA	NA	NA	NA	NA
	12FW3BHA21WG	9/27/2012	426.8	0.21	27	430	**1,900**	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	0.6 J	ND(0.2)
	13FW3BHA01WG	6/10/2013	426.03	0.2	30	380	**2,800**	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	1.2	ND(0.2)
	13FW3BHA02WG[2]	6/10/2013	426.03	0.2	28	380	**3,100**	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	1.3	ND(0.2)
	13FW3BHA22WG	9/5/2013	426.08	0.26	NM	NM	**2,100**	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	0.49 J	ND(0.0099)
	14FWOU322WG	10/13/2014	430.79	0.23	6.6	404	1,300	NA	0.07 J	0.09 J	ND(0.1)	0.13 J	0.09 J	1.4	ND(0.20)
AP-6583	10FWA01WG	6/23/2010	425.05	0.77	NA	NA	1,300	190 B	ND(1)	ND(1)	0.56 J	3.3	0.16 J	0.35 J	ND(0.01) QL
	11FW3BH10WG	6/30/2011	426.05	2.57	14.0	150.0	340	170	ND(1)	ND(1)	ND(1)	1.4	1.4	0.66 J	ND(1)
	11FW3BH81WG	10/7/2011	427.17	0.78	NA	NA	490	63	NA	NA	NA	NA	NA	NA	NA
	12FW3BHA20WG	9/29/2012	426.32	0.19	2.2	130.0	450	NA	ND(0.2)	ND(0.4)	0.33 J	2.0	ND(0.4)	1.5	ND(0.2)
	13FW3BHA06WG	6/11/2013	425.77	0.45	6.6	120.0	**1,500**	NA	ND(0.2)	1.5	0.34 J	1.3	1.4	ND(0.2)	ND(0.2)
	14FWOU323WG	10/13/2014	430.39	0.23	1.8	167.0	390 J	NA	ND(0.1)	0.07 J	0.05 J	0.43 J	ND(0.2)	1.7	ND(0.2)
AP-10234MW[1] (GWP-45)	10FWA02WG	6/23/2010	425.03	0.75	NA	NA	**2,800**	240 B	ND(1)	ND(1)	0.13 J, B	0.93 J	ND(1)	3.8	ND(0.01) QL
	11FW3BH07WG	6/30/2011	426.06	4.03	3.6	120.0	**1,600**	130	ND(1)	ND(1)	ND(1)	0.5 J	0.36 J	2.8	ND(1)
	11FW3BH87WG	11/14/2011	426.71	0.40	0.9	1.2	1,200	880	NA	NA	NA	NA	NA	NA	NA
	12FW3BHA14WG	9/27/2012	426.49	0.16	16.0	44.0	**1,800**	840	ND(0.2)	ND(0.4)	0.17 J	1.3	ND(0.4)	4.8	ND(0.2)
	12FW3BHA15WG[2]	9/27/2012	426.49	0.16	15.0	42.0	**1,800**	850	ND(0.2)	ND(0.4)	0.22 J, B	1.4	ND(0.4)	4.7	ND(0.2)
	13FW3BHA05WG	6/10/2013	425.90	0.19	15.0	46.0	**2,000**	650	ND(0.2)	ND(0.4)	0.26 J	0.57 J	ND(0.4)	4.5	ND(0.2)
	13FW3BHA24WG	9/5/2013	425.82	0.25	NM	NM	1,400	NM	ND(0.4)	ND(0.8)	ND(0.4)	0.87 J	1.2 J	3.9	ND(0.010)
	14FWOU324WG	10/13/2014	430.49	0.11	10.8	80.3	1,200	620	0.07 J	0.08 J	0.11 J	0.8 J	ND(0.2)	3	ND(0.2) QH
	14FWOU325WG	10/13/2014	430.49	0.11	10.3	79.4	1,200	630	0.08 J	0.07 J	0.09 J,J-	0.78 J	ND(0.2)	2.9	ND(0.2) J-
AP-10233MW[1] (GWP-34)	10FWA05WG	6/24/2010	424.45	1.3	NA	NA	**2,100**	200	ND(1)	ND(1)	0.22 J, B	0.28 J	ND(1)	2.8	ND(0.01)
	10FWA06WG[2]	6/24/2010	424.45	1.3	NA	NA	**2,200**	200 B	ND(1)	ND(1)	0.22 J, B	0.25 J	ND(1)	3	ND(0.01)
	11FW3BH09WG	6/30/2011	425.46	5.57	28.0	81.0	1,300	190	ND(1)	ND(1)	ND(1)	0.28 J	ND(1)	4	ND(1)
	11FW3BH88WG	11/14/2011	426.64	0.24	0.2	1.2	1,200	170	NA	NA	NA	NA	NA	NA	NA
	12FW3BHA17WG	9/27/2012	426.43	0.16	21.0	100.0	1,100	NA	ND(0.2)	ND(0.4)	ND(0.2)	0.22 J	ND(0.4)	3.3	ND(0.2)
	13FW3BHA20WG	6/12/2013	426.02	0.72	17.0	93.0	1,100	NA	ND(0.2)	ND(0.4)	ND(0.2)	0.29 J	ND(0.4)	3.6	ND(0.2)
	13FW3BHA25WG	9/5/2013	425.8	0.23	NM	NM	810	NM	ND(0.2)	ND(0.4)	ND(0.2)	0.28 J	ND(0.4)	2.7	ND(0.0099)
	14FWOU326WG	10/13/2014	430.44	3.01	0.0119 J,B	190.0	180 J	NM	ND(0.1)	ND(0.1)	ND(0.1)	0.07 J	ND(0.2)	0.15 J	ND(0.2)
AP-10232MW[1] (GWP-33)	10FWA07WG	6/24/2010	424.22	6.46	NA	NA	440	ND(50)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(0.01)
	11FW3BH32WG	7/6/2011	428.21	5.37	44.0	140.0	340	6.4 J, B	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
	11FW3BH89WG	11/15/2011	426.48	2.74	NA	NA	100 J, Q	9.5 J, B	NA	NA	NA	NA	NA	NA	NA
	11FW3BH90WG[2]	11/15/2011	426.48	2.74	NA	NA	61 J	9.6 J, B	NA	NA	NA	NA	NA	NA	NA
	12FW3BHA18WG	9/27/2012	426.28	6.89	0.026 J	120	130 J	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)
	12FW3BHA19WG[2]	9/27/2012	426.28	6.89	0.022 J	120	130 J	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	0.17 J	ND(0.2)
	13FW3BHA21WG	6/12/2013	426.09	0.51	ND(0.03)	120	310	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	0.62 J	ND(0.2)
	14FWOU327WG	10/14/2014	430.2	3.44	0.004 J,B	89	160 J	NA	ND(0.1)	0.09 J	ND(0.1)	ND(0.2)	ND(0.2)	ND(0.15)	ND(0.2)

Table 5-12 - Groundwater Sample Results in Alluvial Monitoring Wells
Birch Hill Tank Farm

Probe/Well Number	Sample Number	Date	Water Elevation (feet msl)	Dissolved Oxygen (mg/L)	Iron II (mg/L)	Sulfate (mg/L)	DRO	GRO	ROD Contaminants of Concern (µg/L) Benzene	Toluene	Ethylbenzene	1,2,4-Trimethyl-benzene	1,3,5-Trimethyl-benzene	1,2-Dichloro-ethane	1,2-Dibromo-ethane[3]
CLEANUP LEVELS							**1,500**	**2,200**	**5**	**1,000**	**700**	**1,850**	**1,850**	**5**	**0.05**
Thaw Channel/CANOL Road/Off-Post															
AP-7844	10FWTH11WG	6/22/2010	424.76	0.59	NA	NA	150	43 B	ND(1)	0.091 J	ND(1)	0.094 J	ND(1)	2.3	ND(0.01) QL
	11FW3BH21WG	7/5/2011	426.07	4.79	12.0	100.0	910	49	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
	11FW3BH77WG	10/7/2011	426.86	0.44	NA	NA	610	41	NA	NA	NA	NA	NA	NA	NA
	12FW3BHA12WG	9/26/2012	425.78	0.10	10.0	77.0	470	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	2.4	ND(0.2)
	13FW3BHA10WG	6/11/2013	425.66	0.35	11.0	16.0	800	NA	ND(0.2)	0.85 J	ND(0.2)	ND(0.2)	ND(0.4)	2.2	ND(0.2)
	14FWOU331WG	10/15/2014	429.54	0.91	10.1	63.6	NA	NA	ND(0.1)	0.06 J	ND(0.1)	0.07 J	ND(0.2)	2.2	ND(0.2)
AP-7845	10FWTH10WG	6/22/2010	424.89	0.53	NA	NA	**1,900**	58 B	ND(1)	0.13 J	0.095 J	0.17 J	ND(1)	2.5	ND(0.01) QL
	11FW3BH22WG	7/5/2011	426.14	5.96	10.0	97.0	1,000	60	ND(1)	0.84 J, Q	ND(1)	ND(1)	ND(1)	2.3	ND(1)
	11FW3BH23WG[2]	7/5/2011	426.14	5.96	11.0	97.0	1,000	60	ND(1)	1.5	ND(1)	ND(1)	ND(1)	2.3	ND(1)
	11FW3BH76WG	10/7/2011	426.66	0.90	NA	NA	520	51	NA	NA	NA	NA	NA	NA	NA
	12FW3BHA16WG	9/27/2012	425.83	2.17	10.0	81.0	630	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	1.9	ND(0.2)
	13FW3BHA09WG	6/11/2013	425.76	0.77	11.0	76.0	800	NA	ND(0.2)	1.4	ND(0.2)	0.22 J	ND(0.4)	2.6	ND(0.2)
	14FWOU348WG	10/15/2014	429.66	0.41	9.8	62.1	430 J,J-	NA	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.2)	ND(0.2)	1.6	ND(0.2)
AP-5782	10FWTH15WG	6/22/2010	424.83	0.48	12	120	**1,800**	52 B	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	2.2	ND(0.01) QL
	11FW3BH27WG	7/5/2011	426.00	1.00	9.5 J	84	490	26 B	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
	11FW3BH78WG	10/7/2011	426.87	0.74	NA	NA	250	19 J	NA	NA	NA	NA	NA	NA	NA
	12FW3BHA10WG	9/26/2012	425.95	0.22	10.0	77.0	460	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	2.0	ND(0.2)
	13FW3BHA17WG	6/12/2013	425.77	1.65	9.5	66.0	420	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	0.83 J	ND(0.2)
	14FWOU333WG	10/15/2014	429.76	0.43	7.4	35.1	NA	NA	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.2)	ND(0.2)	0.56	ND(0.2)
AP-5783	10FWTH14WG	6/22/2010	424.91	1.02	NA	NA	570	ND(50)	ND(1) B	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(0.01) QL
	11FW3BH26WG	7/5/2011	426.02	9.15	0.3	11.0	300	ND(25)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
	11FW3BH79WG	10/7/2011	426.94	5.90	NA	NA	39 J	9.5 J, B	NA	NA	NA	NA	NA	NA	NA
	12FW3BHA09WG	9/26/2012	426.04	3.06	0.1	9.8	ND(67)	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)
	13FW3BHA18WG	6/12/2013	425.84	7.78	0.091 J	5.4	160 J	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)
	14FWOU334WG	10/15/2014	429.86	1.98	1.09	14.8	NA	NA	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)
AP-7952	10FWTH18WG	6/23/2010	424.99	0.37	NA	NA	970	20 J, B	ND(1) B	ND(1)	ND(1)	ND(1)	ND(1)	1	ND(0.01) QL
	10FWTH19WG[2]	6/23/2010	424.99	0.37	NA	NA	970	21 J, B	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	1	ND(0.01) QL
	11FW3BH24WG	7/5/2011	426.16	1.23	9.5	65.0	270	15 J, B	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
	11FW3BH80WG	10/7/2011	426.99	0.20	NA	NA	97 J	11 J, B	NA	NA	NA	NA	NA	NA	NA
	12FW3BHA11WG	9/26/2012	426.08	0.17	9.4	56.0	250	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	0.81 J	ND(0.2)
	13FW3BHA19WG	6/12/2013	425.91	0.99	9.9	62.0	330	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	0.61 J	ND(0.2)
	14FWOU335WG	10/15/2014	429.90	0.32	7.3	24.3	NA	NA	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.2)	ND(0.2)	0.21 J	ND(0.2)
Shannon Park	10FWTH16WG	6/23/2010	424.76	0.19	NA	NA	630	33 J	ND(1) B	0.15 J	ND(1)	ND(1)	ND(1)	1.3	ND(0.01) QL
	11FW3BH36WG	7/6/2011	426.07	0.86	14.0	34.0	420	17 J, B	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	0.73 J	ND(1)
	11FW3BH75WG	10/6/2011	426.80	1.16	NA	NA	220 J	20 J, B	NA	NA	NA	NA	NA	NA	NA
	13FW3BHA15WG	6/12/2013	425.72	0.37	9.0	ND(0.5)	210 J	NA	ND(0.2)	0.25 J	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)
	14FWOU337WG	10/15/2014	429.24	0.42	10.3	1.6	NA	NA	ND(0.1)	0.14 J	ND(0.1)	ND(0.2)	ND(0.2)	0.42 J	ND(0.2)
Steese Chapel	11FW3BH83WG	10/10/2011	NM	NA	6.4	64.0	89 J	ND(25) Q	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	1.2	ND(1)
	11FW3BH84WG[2]	10/10/2011	NM	NA	6.4	63.0	110 J	42	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	1.3	ND(1)
	12FW3BHA23WG	9/28/2012	NM	NA	9.1	61.0	170 J	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	1.8	ND(0.2)
	13FW3BHA14WG	6/11/2013	NM	NA	10.0	60.0	200 J	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	1.3	ND(0.2)
	14FWOU336WG	10/15/2014	NM	NA	8.5	52.7	NA	NA	ND(0.1)	0.09 J	ND(0.1)	ND(0.2)	ND(0.2)	1.4	ND(0.2)
UAF ML7-80'	10FWTH17WG	6/23/2010	424.82	0.35	NA	NA	640	21 J	ND(1) B	0.094 J	ND(1)	0.061 J	ND(1)	2.6	ND(0.01) QL
	11FW3BH37WG	7/6/2011	426.14	1.38	11.0	71.0	250	17 J, B	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	2	ND(1)
	11FW3BH38WG[2]	7/6/2011	426.14		NA	NA	290	15 J, B	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	2.1	ND(1)
	11FW3BH74WG	10/6/2011	426.79	1.74	NA	NA	140 J	14 J, B	NA	NA	NA	NA	NA	NA	NA
	12FW3BHA04WG	9/25/2012	425.92	0.17	11.0	59.0	210 J	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	1.6	ND(0.2)
	13FW3BHA16WG	6/12/2013	425.77	0.54	12.0	66.0	310	NA	ND(0.2)	0.21 J	ND(0.2)	ND(0.2)	ND(0.4)	1.9	ND(0.2)
	14FWOU338WG	10/15/2014	429.24	0.53	10.1	52.0	NA	NA	ND(0.1)	0.19 J	ND(0.1)	ND(0.2)	ND(0.2)	2	ND(0.2)

Table 5-12 - Groundwater Sample Results in Alluvial Monitoring Wells
Birch Hill Tank Farm

Probe/Well Number	Sample Number	Date	Water Elevation (feet msl)	Dissolved Oxygen (mg/L)	Iron II (mg/L)	Sulfate (mg/L)	DRO	GRO	ROD Contaminants of Concern (µg/L) Benzene	Toluene	Ethylbenzene	1,2,4-Trimethyl-benzene	1,3,5-Trimethyl-benzene	1,2-Dichloro-ethane	1,2-Dibromo-ethane[3]
CLEANUP LEVELS							**1,500**	**2,200**	**5**	**1,000**	**700**	**1,850**	**1,850**	**5**	**0.05**
AP-9958	10FWTH01WG	2/10/2010	424.57	1.08	NA	NA	NA	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	0.35 J	ND(0.02)
	10FWTH06WG	6/22/2010	424.82	0.68	NA	NA	450	ND(50)	ND(1)	0.12 J	ND(1)	ND(1)	ND(1)	ND(1)	ND(0.01) QL
	10FWTH26WG	8/17/2010	425.53	0.43	10.90	0.046	NA	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	0.37 J	ND(0.01)
	10FWTH31WG	11/9/2010	424.95	0.45	10.70	45.5	NA	NA	ND(1)	0.27 J ,B,QH	ND(1)	ND(1)	ND(1)	0.41 J, QH	ND(0.019)
	10FWTH32WG[2]	11/9/2010	424.95		NA	NA	NA	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	0.4 J	ND(0.020)
	11FW3BH03WG	6/30/2011	425.79	0.72	11.00	48	ND(240)	8.6 J, B	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
	11FW3BH71WG	10/6/2011	426.84	1.85	NA	NA	140 J	8.1 J, B	NA	NA	NA	NA	NA	NA	NA
	11FW3BH72WG[2]	10/6/2011	426.84		NA	NA	130 J	7.3 J, B	NA	NA	NA	NA	NA	NA	NA
	12FW3BHA01WG	9/25/2012	425.95	0.16	9.4	46.0	190 J	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	0.34 J	ND(0.2)
	13FW3BHA08WG	6/11/2013	425.73	1.79	9.4	40.0	310	NA	ND(0.2)	ND(0.4)	ND(0.2)	0.48 J	0.19 J	0.41 J	ND(0.2)
	14FWOU343WG	10/15/2014	429.51	0.56	7.8	29.7	200 J,J-	NA	ND(0.1)	0.07 J	ND(0.1)	ND(0.2)	ND(0.2)	0.26 J	ND(0.2)
	14FWOU344WG	10/15/2014	429.51	0.56	7.8	29.7	200 J,J-	NA	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.2)	ND(0.2)	0.25 J	ND(0.2)
AP-9956	10FWTH05WG	2/10/2010	424.51	1.33	NA	NA	NA	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	1.4	ND(0.02)
	10FWTH09WG	6/22/2010	424.77	0.40	11.00	77	750	34 J, B	ND(1)	0.12 J	ND(1)	ND(1)	ND(1)	1.5	ND(0.01) QL
	10FWTH29WG	8/17/2010	425.42	0.14	NA	NA	NA	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	1.3	ND(0.010)
	10FWTH34WG	11/9/2010	424.87	0.44	NA	NA	NA	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	1.4	ND(0.020)
	11FW3BH05WG	6/30/2011	425.80	0.79	10.0	65.0	160 J	24 J, B	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	1.1	ND(1)
	11FW3BH73WG	10/6/2011	426.78	2.04	NA	NA	230 J	18 J, B	NA	NA	NA	NA	NA	NA	NA
	12FW3BHA02WG	9/25/2012	425.89	0.19	10.0	67.0	300	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	1.1	ND(0.2)
	13FW3BHA07WG	6/11/2013	425.72	2.01	9.4	56.0	420	NA	ND(0.2)	0.18 J	ND(0.2)	ND(0.2)	ND(0.4)	1.2	ND(0.2)
	14FWOU345WG	10/15/2014	429.36	0.41	9.9	49.1	170 J,J-	NA	ND(0.1)	0.06 J	ND(0.1)	ND(0.2)	ND(0.2)	1.3	ND(0.2)
Truck Fill Stand															
AP-10228MW[1] (GWP-100)	10FWC01WG	6/23/2010	424.87	0.34	NA	NA	**8,800**	38 J, B	**5.7**	ND(1)	0.091 J, B	0.069 J	ND(1)	ND(1)	ND(0.01) QL
	11FW3BH18WG	7/5/2011	426.10	3.39	2.8	44.0	**1,900**	14 J	1.3	0.61 J	0.4 J	0.19 J	ND(1)	0.21 J	ND(1)
	11FW3BH91WG	11/15/2011	426.42	0.35	0.018 J, B	2.2	**2,200**	18 J, B	NA	NA	NA	NA	NA	NA	NA
	12FW3BHA05WG	9/26/2012	426.26	0.36	2.9	24	**5,100**	NA	3.0	ND(0.4)	0.23 J	ND(0.2)	ND(0.4)	0.29 J	ND(0.2)
	12FW3BHA06WG[2]	9/26/2012	426.26	0.36	3	24	**5,100**	NA	2.9	ND(0.4)	0.24 J	ND(0.2)	ND(0.4)	0.28 J	ND(0.2)
	13FW3BHA11WG	6/11/2013	425.97	0.3	2.7	31	**3,600**	NA	0.47 J	0.74 J	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)
	13FW3BHA12WG[2]	6/11/2013	425.97	0.3	2.8	31	**3,500**	NA	0.42 J	0.72 J	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)
	14FWOU328WG	10/14/2014	429.97	0.81	1.13	35.5	**10,000**	NA	0.75	0.15 J	0.19 J	0.07 J	ND(0.2)	0.16 J	**0.13 J**
	14FWOU329WG	10/14/2014	429.97	0.81	1.13	35.5	**12,000**	NA	0.78	0.17J	0.25 J	ND(0.2)	ND(0.2)	0.15 J	**0.13 J**
AP-10230MW[1] (GWP-145)	10FWC02WG	6/23/2010	424.81	11.03	NA	NA	**10,000 QH**	100 B	1.1	ND(1)	6.4	1.7	2.2	ND(1)	ND(0.01) QL
	11FW3BH19WG	7/5/2011	426.13	6.36	8.9	18.0	**17,000 QH**	75	0.64 J	0.48 J	3.9	0.95 J	1.1	ND(1)	ND(1)
	11FW3BH92WG	11/15/2011	421.01	0.48	0.23	38 QH	**38,000 QH**	230	NA	NA	NA	NA	NA	NA	NA
	12FW3BHA07WG	9/26/2012	426.27	0.3	34	13	**30,000**	NA	0.82 J	0.39 J	2.2	1.3	2.2	ND(0.2)	ND(0.2)
	13FW3BHA13WG	6/11/2013	425.67	0.23	16	23	**10,000**	NA	ND(0.2)	0.66 J	0.31 J	0.24 J	0.31 J	ND(0.2)	ND(0.2)
	14FWOU330WG	10/14/2014	430.01	1.37	19.2	22.5	**44000 J+**	NA	2.1	0.32 J,B	0.44 J	1.0 J	2.7	0.22 J	**0.55 J**
AP-10229MW[1] (GWP-121)	10FWC03WG	6/23/2010	424.06	3.69	0.035	55	**6,300**	ND(50)	1.4	ND(1)	0.062 J, B	0.13 J	ND(1)	ND(1)	ND(0.01) QL
	11FW3BH20WG	7/5/2011	425.47	7.71	0.037 J	53	**2,700**	16 J, B	0.63 J	0.26 J	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
	11FW3BH93WG	11/15/2011	426.42	0.34	0.0095 J, B	1.2	1,200	9.5 J, B	NA	NA	NA	NA	NA	NA	NA
	12FW3BHA08WG	9/26/2012	426.27	0.34	ND(0.030)	41	950	NA	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)

Bold results represent concentrations in excess of remedial action goals
[1] Replacement wells installed in November 2011. Wells that were replaced are shown in parentheses.
[2] Denotes sample is a field duplicate of preceding row.
[3] 1,2-Dibromoethane results were generated from either Method 8260 or Method 504.1. Results from Method 504.1 were used when available.

DRO - diesel range organics
GRO - gasoline range organics
LOD - limit of detection
LOQ - limit of quantitation
µg/L - micrograms per liter

mg/L - milligram per liter
msl - mean sea level
NA - not analyzed
NM - not measured
ROD - Record of Decision

Data Qualifiers
B - analyte was detected in blank sample at similar concentration
J - detected between detection limit and LOQ
M - result is estimated and biased (H-high/L-low) due to matrix interference
ND - not detected at the detection limit (LOQ in parentheses for data prior to 2012. LOD in parentheses for data staring in 2012.)
Q - result is estimated and biased (H-high/L-low) due to quality control failure

Table 2-8A - Summary of Mann-Kendall Trend Analysis of BHTF Alluvial Wells[1,2]

Well	DCA						DRO	
	2008	2009	2010	2011	2012	2013	2012	2013
AP-5782	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable
AP-10227MW (AP-7603)	Increasing	Increasing	Increasing	Increasing	Increasing	Increasing	Stable	Stable
AP-7844	Decreasing	Decreasing	Decreasing	Decreasing	Decreasing	Decreasing	Stable	No Trend
AP-7845	Potentially Decreasing	Potentially Decreasing	**Stable**	Stable	Stable	No Trend	Stable	Stable
AP-7952	-	-	**-**	-	-	-	Stable	Stable
AP-9956	-	Stable	Stable	**Decreasing**	Decreasing	Decreasing	Stable	No Trend
AP-10233MW (GWP-34)	Stable	Stable	**No Trend**	No Trend	No Trend	**Potentially Increasing**	Decreasing	Decreasing
AP-10234MW (GWP-45)	Increasing	Increasing	Increasing	Increasing	Increasing	Increasing	Stable	Stable
AP-6583	-	-	-	-	-	-	Stable	No Trend
UAF ML7	Potentially Decreasing	Decreasing	Decreasing	**No Trend**	**Decreasing**	Decreasing	-	-

[1] Only wells having concentrations exceeding 1/2 the cleanup level during the period of analysis are shown

[2] No alluvial BHTF wells (Truck Fill Stand not included in analysis) had benzene or EDB concentrations exceeding half the cleanup level

- Analyte did not exceed 1/2 the cleanup level during the analysis period

2010 trend change shown in blue

2011 trend change shown in red

2012 trend change shown in orange

2013 trend changes shown in green

Table 2-8B - Summary of Mann-Kendall Trend Analysis of Truck Fill Stand Wells[1,2]

Well	Benzene			DRO		
	2011	2012	2013	2011	2012	2013
AP-10228MW (GWP-100)	Potentially Increasing	**Increasing**		Stable	Stable	
AP-10229MW (GWP-121)	-	-		Increasing	**Decreasing**	
AP-10230MW (GWP-145)	No Trend	No Trend		Stable	**Increasing**	

[1] Only wells having concentrations exceeding 1/2 the cleanup level during the period of analysis are shown

[2] No TFS wells had DCA concentrations exceeding half the cleanup level. EDB was detected above the cleanup level in one sampling event in AP-10230MW. Only intermittent low-level detections are generally observed.

- Analyte did not exceed 1/2 the cleanup level during the analysis period

2010 trend change shown in blue

2011 trend change shown in red

2012 trend change shown in orange

2013 trend changes shown in green

Table 2-9 - Summary of Mann-Kendall Trend Analysis of BHTF Bedrock Wells[1]

Well	DCA				Benzene				EDB			
	2010	2011	2012	2013	2010	2011	2012	2013	2010	2011	2012	2013
Wells Upgradient or East of BHPR System												
AP-7596	**Increasing**	**No Trend**	No Trend	No Trend	Increasing	**Potentially Increasing**	**No Trend**	No Trend	Decreasing	Decreasing	Decreasing	Decreasing
AP-7852	-	-	-	No Trend	-	-	-	-	**Increasing**	Increasing	Increasing	Increasing
AP-7594	Decreasing	Decreasing	Decreasing	Decreasing	Decreasing	**-**	**-**	Decreasing	Decreasing	Decreasing	Decreasing	Decreasing
Wells within BHPR System Area												
AP-7813	**Potentially Increasing**	**Increasing**	**No Trend**	No Trend	Decreasing	Decreasing	Decreasing	Decreasing	Stable	**Decreasing**	Decreasing	Decreasing
AP-7525	No Trend	No Trend	No Trend	No Trend	-	-	-	-	-	-	-	-
AP-7530	Increasing	Increasing	Increasing	Increasing	Decreasing	Decreasing	Decreasing	Decreasing	-	-	-	-
AP-7848	No Trend	No Trend	No Trend	**NS**	Decreasing	**Potentially Decreasing**	**Decreasing**	**NS**	-	-	-	**NS**
AP-7854	No Trend	No Trend	No Trend	No Trend	No Trend	-	-	-	-	-	-	-
AP-7855	**Increasing**	**No Trend**	**Increasing**	Increasing	-	-	-	-	-	-	-	-
AP-7859	**No Trend**	**Potentially Increasing**	**Increasing**	Increasing	Decreasing	Decreasing	Decreasing	Decreasing	-	-	-	-
AP-7600	Stable	**No Trend**	No Trend	No Trend	Decreasing	Decreasing	Decreasing	Decreasing	-	-	-	-
Wells at the Base of Birch Hill												
AP-10226MW (1173-MP1)	**Increasing**	**No Trend**	**Increasing**	Increasing	**Stable**	Stable	**No Trend**	No Trend	Decreasing	Decreasing	Decreasing	Decreasing
AP-8422	Increasing	Increasing	Increasing	Increasing	No Trend	No Trend	No Trend	No Trend	-	-	-	-
AP-7597	**Increasing**	Increasing	-	-	-	-	-	-	-	-	-	-
Wells in the Thaw Channel or Off-Post												
AP-7846	-	-	-	-	-	-	-	-	-	-	-	-

[1] Trends are shown for wells with contaminant concentrations exceeding 1/2 the cleanup level in the last year of the analysis

- Analyte did not exceed 1/2 the cleanup level during the year shown

NA = Not Applicable. The well was not included in the analysis during that time period.

NS = Not Sampled. The well was not sampled due to the presence of free product.

MAROS Statistical Trend Analysis Summary

Project: 2014 BHTF Bedrock

Location: Ft Wainwright

User Name: FES

State: Alaska

Time Period: 8/1/2003 **to** 10/14/2014

Consolidation Period: No Time Consolidation

Consolidation Type: Average

Duplicate Consolidation: Average

ND Values: Specified Detection Limit

J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Average Conc. (mg/L)	Median Conc. (mg/L)	All Samples "ND" ?	Mann-Kendall Trend	Linear Regression Trend
1,2-DIBROMOETHANE (ETHYLENE DIBROMID								
1173-MP1	T	18	10	6.0E-05	2.9E-05	No	PD	NT
AP-6071	T	15	0	4.0E-06	4.0E-06	Yes	ND	ND
AP-7525	T	18	0	4.0E-06	4.0E-06	Yes	ND	ND
AP-7530	T	18	0	4.0E-06	4.0E-06	Yes	ND	ND
AP-7594	T	18	18	2.6E-01	2.7E-01	No	D	D
AP-7595	T	16	2	6.8E-06	4.0E-06	No	NT	NT
AP-7596	S	18	18	1.5E-02	9.6E-03	No	D	D
AP-7597	T	18	0	4.0E-06	4.0E-06	Yes	ND	ND
AP-7598	T	18	0	4.0E-06	4.0E-06	Yes	ND	ND
AP-7600	T	18	5	4.4E-05	4.0E-06	No	NT	NT
AP-7673	T	17	14	3.8E-05	2.8E-05	No	D	D
AP-7730	T	4	0	4.0E-06	4.0E-06	Yes	ND	ND
AP-7813	T	17	17	1.6E-03	6.7E-04	No	D	D
AP-7816	T	17	0	4.0E-06	4.0E-06	Yes	ND	ND
AP-7846	T	18	0	4.0E-06	4.0E-06	Yes	ND	ND
AP-7848	T	17	1	4.2E-06	4.0E-06	No	S	S
AP-7852	T	17	17	5.1E-02	4.8E-02	No	I	I
AP-7854	T	18	2	1.3E-05	4.0E-06	No	NT	D
AP-7855	T	18	3	1.2E-05	4.0E-06	No	NT	D
AP-7856	T	18	0	4.0E-06	4.0E-06	Yes	ND	ND
AP-7859	T	18	10	5.0E-05	9.8E-06	No	D	D
AP-8422	T	16	3	1.9E-05	4.0E-06	No	PD	D
AP-9181	T	13	0	4.0E-06	4.0E-06	Yes	ND	ND
AP-9957	T	13	0	4.0E-06	4.0E-06	Yes	ND	ND
AP-9959	T	13	0	4.0E-06	4.0E-06	Yes	ND	ND
C-1 (AP-6560)	T	13	0	4.0E-06	4.0E-06	Yes	ND	ND
1,2-DICHLOROETHANE								
1173-MP1	T	18	15	8.9E-02	8.6E-02	No	I	NT
AP-6071	T	15	0	2.0E-04	2.0E-04	Yes	ND	ND
AP-7525	T	18	18	1.9E-02	1.7E-02	No	S	S
AP-7530	T	18	17	4.4E-02	5.4E-02	No	I	I
AP-7594	T	18	17	1.7E-02	1.7E-02	No	D	S
AP-7595	T	15	0	2.0E-04	2.0E-04	Yes	ND	ND
AP-7596	S	18	17	8.5E-01	7.1E-01	No	NT	NT

MAROS Statistical Trend Analysis Summary

Well	Source/ Tail	Number of Samples	Number of Detects	Average Conc. (mg/L)	Median Conc. (mg/L)	All Samples "ND" ?	Mann-Kendall Trend	Linear Regression Trend
1,2-DICHLOROETHANE								
AP-7597	T	18	9	1.2E-03	5.4E-04	No	I	PI
AP-7598	T	18	18	2.1E-03	2.1E-03	No	D	D
AP-7600	T	18	17	1.0E-01	1.1E-01	No	NT	NT
AP-7673	T	18	13	7.4E-04	5.1E-04	No	D	D
AP-7730	T	4	4	1.4E-03	1.4E-03	No	I	I
AP-7813	T	17	17	7.8E-02	7.6E-02	No	NT	NT
AP-7816	T	18	5	4.1E-04	2.0E-04	No	I	I
AP-7846	T	18	7	3.3E-04	2.0E-04	No	PI	I
AP-7848	T	17	3	9.3E-03	2.0E-04	No	NT	NT
AP-7852	T	17	13	1.1E-03	1.1E-03	No	NT	NT
AP-7854	T	18	10	4.8E-03	1.1E-03	No	NT	PD
AP-7855	T	18	13	5.0E-03	3.5E-03	No	I	NT
AP-7856	T	18	9	4.3E-03	6.5E-04	No	NT	NT
AP-7859	T	18	15	2.8E-02	3.5E-02	No	PI	NT
AP-8422	T	17	17	2.4E-02	2.1E-02	No	I	I
AP-9181	T	13	12	1.0E-03	1.0E-03	No	NT	NT
AP-9957	T	13	11	5.9E-04	6.1E-04	No	NT	NT
AP-9959	T	13	13	8.6E-04	7.2E-04	No	S	PD
C-1 (AP-6560)	T	13	12	9.4E-04	1.1E-03	No	NT	I
BENZENE								
1173-MP1	T	18	18	1.6E+00	1.5E+00	No	NT	I
AP-6071	T	15	2	1.6E-04	1.0E-04	No	NT	NT
AP-7525	T	18	14	1.1E-03	8.7E-04	No	S	S
AP-7530	T	18	18	1.5E-02	1.1E-02	No	D	D
AP-7594	T	18	17	4.4E-03	2.8E-03	No	D	D
AP-7595	T	17	5	1.8E-04	1.0E-04	No	NT	NT
AP-7596	S	18	18	5.7E+00	5.0E+00	No	NT	I
AP-7597	T	18	17	6.3E-03	1.5E-03	No	D	D
AP-7598	T	18	0	1.0E-04	1.0E-04	Yes	ND	ND
AP-7600	T	18	18	3.0E-02	1.5E-02	No	D	D
AP-7673	T	16	2	1.7E-04	1.0E-04	No	NT	NT
AP-7730	T	4	4	5.5E-04	5.4E-04	No	S	S
AP-7813	T	17	17	2.7E-01	1.4E-01	No	D	D
AP-7816	T	18	18	9.4E-04	8.0E-04	No	S	D
AP-7846	T	18	15	3.5E-03	4.5E-03	No	D	D
AP-7848	T	17	17	1.3E+00	1.3E+00	No	D	S
AP-7852	T	17	14	5.1E-04	4.1E-04	No	I	I
AP-7854	T	18	18	2.4E-02	1.8E-02	No	D	D
AP-7855	T	18	17	4.0E-02	1.8E-02	No	D	D
AP-7856	T	18	18	9.8E-02	4.3E-02	No	D	D
AP-7859	T	18	18	6.1E-01	3.6E-01	No	D	D
AP-8422	T	18	17	7.1E-02	7.4E-02	No	NT	NT
AP-9181	T	13	2	1.1E-04	1.0E-04	No	NT	NT
AP-9957	T	13	3	9.8E-05	1.0E-04	No	NT	NT
AP-9959	T	13	1	9.7E-05	1.0E-04	No	NT	NT

MAROS Statistical Trend Analysis Summary

Well	Source/ Tail	Number of Samples	Number of Detects	Average Conc. (mg/L)	Median Conc. (mg/L)	All Samples "ND" ?	Mann-Kendall Trend	Linear Regression Trend
BENZENE								
C-1 (AP-6560)	T	13	3	1.0E-04	1.0E-04	No	S	I

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); No Detectable Concentration (NDC)

The Number of Samples and Number of Detects shown above are post-consolidation values.

MAROS Statistical Trend Analysis Summary

Project: BHTF Alluvial Aquifer

Location: Fort Wainwright

User Name: FES

State: Alaska

Time Period: 3/25/2003 **to** 10/15/2014

Consolidation Period: No Time Consolidation

Consolidation Type: Average

Duplicate Consolidation: Average

ND Values: Detection Limit

J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Average Conc. (mg/L)	Median Conc. (mg/L)	All Samples "ND" ?	Mann-Kendall Trend	Linear Regression Trend
1,2-DICHLOROETHANE								
AP-5782	T	25	23	1.8E-03	1.9E-03	No	PD	PD
AP-5783	T	19	3	2.2E-04	2.0E-04	No	NT	NT
AP-6583	T	18	6	3.7E-04	2.0E-04	No	NT	I
AP-7603	S	19	12	3.4E-03	1.2E-03	No	I	I
AP-7844	T	25	24	3.1E-03	2.5E-03	No	D	D
AP-7845	T	25	25	1.8E-03	1.7E-03	No	NT	NT
AP-7952	T	19	9	4.9E-04	2.0E-04	No	NT	NT
AP-9956	T	13	13	1.5E-03	1.4E-03	No	D	PD
AP-9958	T	13	9	3.5E-04	3.4E-04	No	S	S
GWP-2002A	T	18	7	3.0E-04	2.0E-04	No	I	I
GWP-33	T	19	11	4.8E-04	2.3E-04	No	S	PD
GWP-34	T	19	14	1.4E-03	1.2E-03	No	NT	NT
GWP-45	T	19	11	1.6E-03	9.0E-04	No	I	I
Shannon Park	T	24	22	1.2E-03	9.1E-04	No	D	D
Steese Chapel	T	7	3	7.6E-04	2.0E-04	No	PI	I
UAF ML7	T	23	23	2.6E-03	2.8E-03	No	D	D
BENZENE								
AP-5782	T	25	2	1.0E-04	1.0E-04	No	S	S
AP-5783	T	19	1	1.0E-04	1.0E-04	No	S	D
AP-6583	T	19	4	1.5E-04	1.0E-04	No	NT	I
AP-7603	S	19	12	5.4E-04	4.2E-04	No	S	S
AP-7844	T	25	2	9.9E-05	1.0E-04	No	S	D
AP-7845	T	25	1	1.0E-04	1.0E-04	No	S	D
AP-7952	T	19	10	5.7E-04	1.0E-04	No	PD	D
AP-9956	T	4	0	2.0E-04	2.0E-04	Yes	ND	ND
AP-9958	T	4	0	2.0E-04	2.0E-04	Yes	ND	ND
GWP-2002A	T	18	4	1.1E-04	1.0E-04	No	NT	D
GWP-33	T	19	1	1.0E-04	1.0E-04	No	S	D
GWP-34	T	19	5	2.8E-04	1.0E-04	No	NT	D
GWP-45	T	19	12	2.7E-04	1.3E-04	No	D	D
Shannon Park	T	24	14	1.3E-03	1.1E-03	No	D	D
Steese Chapel	T	7	0	1.0E-04	1.0E-04	Yes	ND	ND
UAF ML7	T	23	1	1.0E-04	1.0E-04	No	S	D

MAROS Statistical Trend Analysis Summary

Well	Source/ Tail	Number of Samples	Number of Detects	Average Conc. (mg/L)	Median Conc. (mg/L)	All Samples "ND" ?	Mann-Kendall Trend	Linear Regression Trend
PHC as DIESEL FUEL								
PHC as DIESEL FUEL								
AP-5782	T	5	5	6.8E-01	4.6E-01	No	S	S
AP-5783	T	5	4	2.6E-01	2.5E-01	No	S	S
AP-6583	T	6	6	6.6E+01	9.0E-01	No	NT	I
AP-7603	S	6	6	9.0E+00	6.3E+00	No	S	PD
AP-7844	T	5	5	5.9E-01	6.1E-01	No	NT	NT
AP-7845	T	6	6	7.2E+01	9.0E-01	No	NT	PI
AP-7952	T	5	5	3.8E-01	2.7E-01	No	S	S
AP-9956	T	6	6	2.9E+01	3.6E-01	No	NT	PI
AP-9958	T	6	5	3.4E+01	2.8E-01	No	NT	PI
GWP-2002A	T	5	5	2.6E+02	3.2E+00	No	NT	NT
GWP-33	T	6	6	2.7E+01	3.3E-01	No	NT	PI
GWP-34	T	6	6	3.1E+01	1.3E+00	No	NT	PI
GWP-45	T	6	6	2.0E+02	1.9E+00	No	NT	PI
Shannon Park	T	5	5	3.4E-01	2.2E-01	No	D	D
Steese Chapel	T	3	3	1.5E-01	1.7E-01	No	N/A	N/A
UAF ML7	T	5	5	3.1E-01	2.5E-01	No	S	S
PHC as GASOLINE								
AP-5782	T	3	3	3.2E-02	2.6E-02	No	N/A	N/A
AP-5783	T	3	1	3.6E-02	5.0E-02	No	N/A	N/A
AP-6583	T	2	2	1.2E-01	1.2E-01	No	N/A	N/A
AP-7603	S	6	6	1.2E+00	9.4E-01	No	NT	NT
AP-7844	T	3	3	4.4E-02	4.3E-02	No	N/A	N/A
AP-7845	T	3	3	5.6E-02	5.8E-02	No	N/A	N/A
AP-7952	T	3	2	2.7E-02	2.0E-02	No	N/A	N/A
AP-9956	T	3	3	2.5E-02	2.4E-02	No	N/A	N/A
AP-9958	T	3	2	4.8E-02	5.0E-02	No	N/A	N/A
GWP-2002A	T	2	2	5.9E-02	5.9E-02	No	N/A	N/A
GWP-33	T	3	2	4.1E-02	5.0E-02	No	N/A	N/A
GWP-34	T	3	3	1.9E-01	1.9E-01	No	N/A	N/A
GWP-45	T	6	6	1.0E+02	7.5E-01	No	NT	I
Shannon Park	T	3	3	2.3E-02	2.0E-02	No	N/A	N/A
Steese Chapel	T	1	0	5.0E-02	5.0E-02	Yes	ND	ND
UAF ML7	T	3	3	1.7E-02	1.7E-02	No	N/A	N/A

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); No Detectable Concentration (NDC)

The Number of Samples and Number of Detects shown above are post-consolidation values.

OU-3 Remedial Area 2 Valve Pits and ROLF

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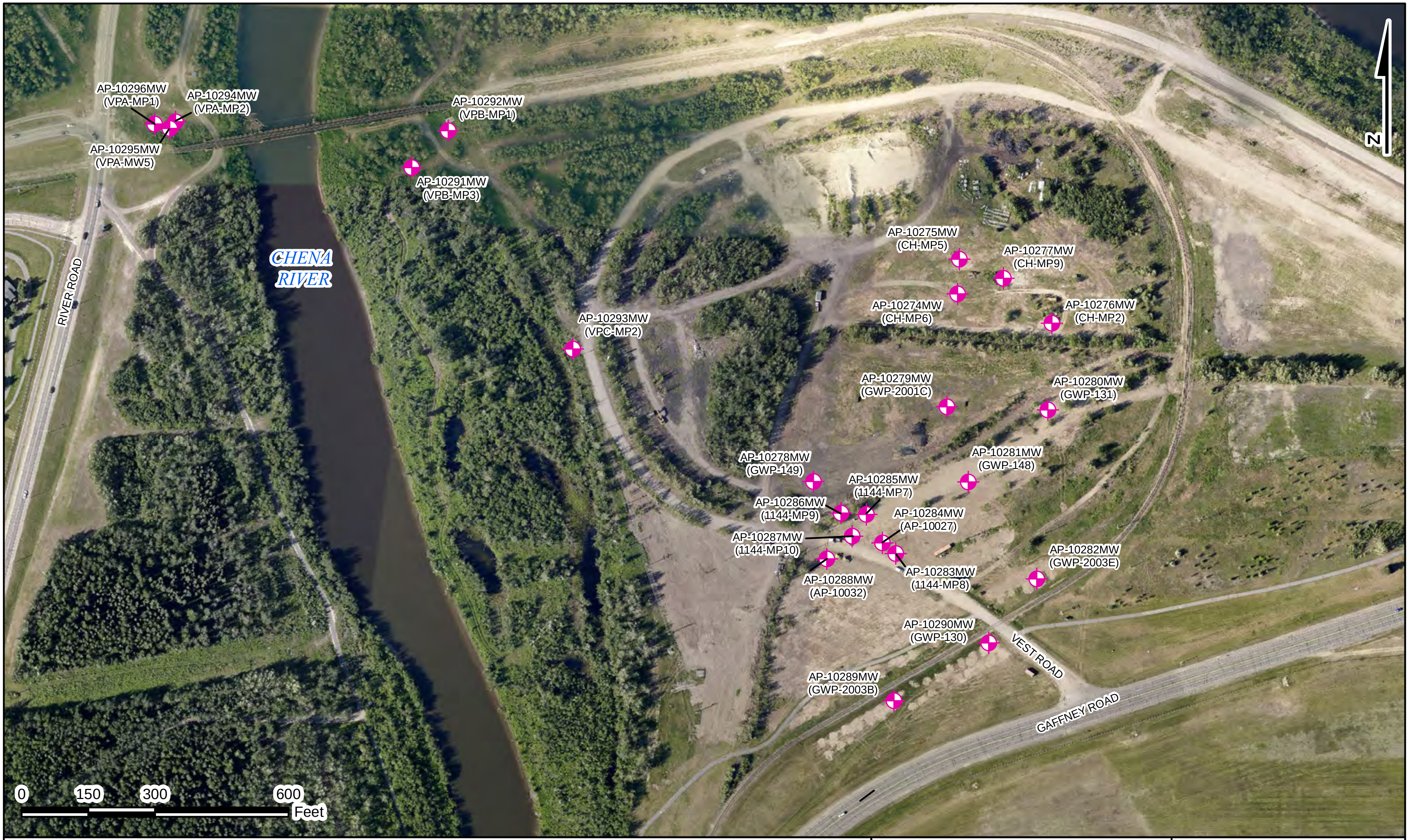


LEGEND:

AP-10289MW (GWP-2003B) — 2015 Replacement Well (Well or Probe Replaced)

NOTES:

1. Replacement wells were installed in March or April 2015. Wells or probes that were replaced were decommissioned.

2. Coordinate System: WGS84 UTM, Zone 6N, US Survey, Meters (Displayed in Feet)

SOURCE:

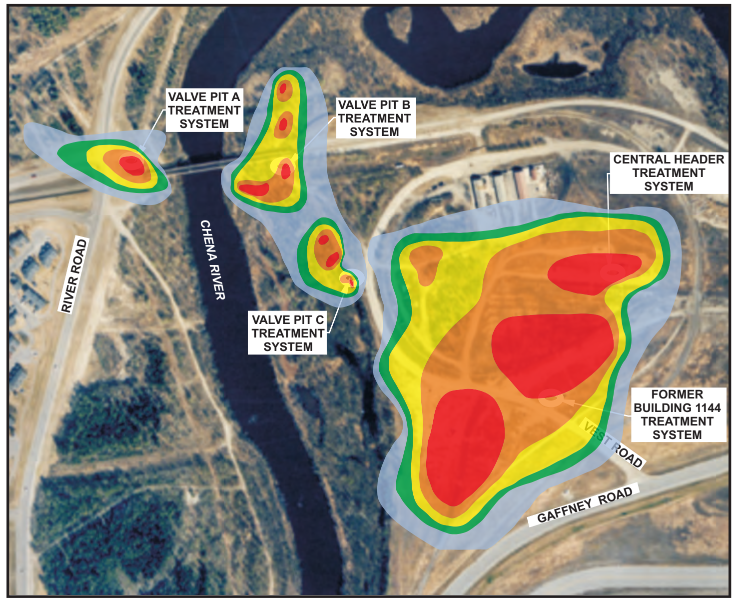
1. Aerial Imagery Provided By: 2012 Fort Wainwright .SID

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

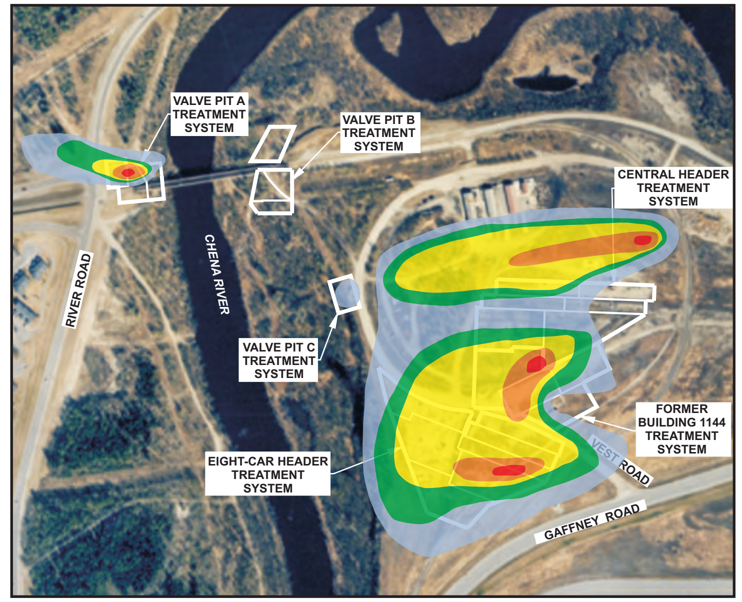
ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

2015 Replacement Well Locations
2015 Monitoring Report
Operable Unit 3
Fort Wainwright, Alaska

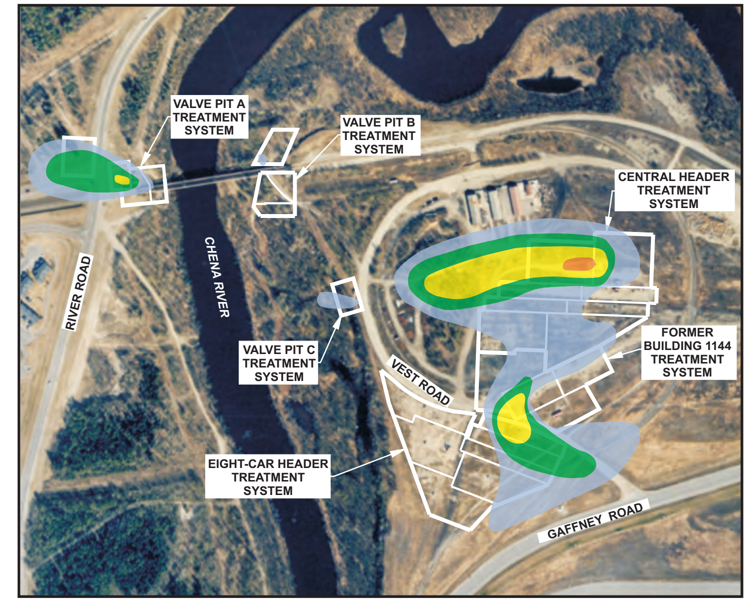
Contract: W911KB-12-D-0001	Figure: 3-1	Date: 4/16



Prior to Treatment 1996-1997



1998



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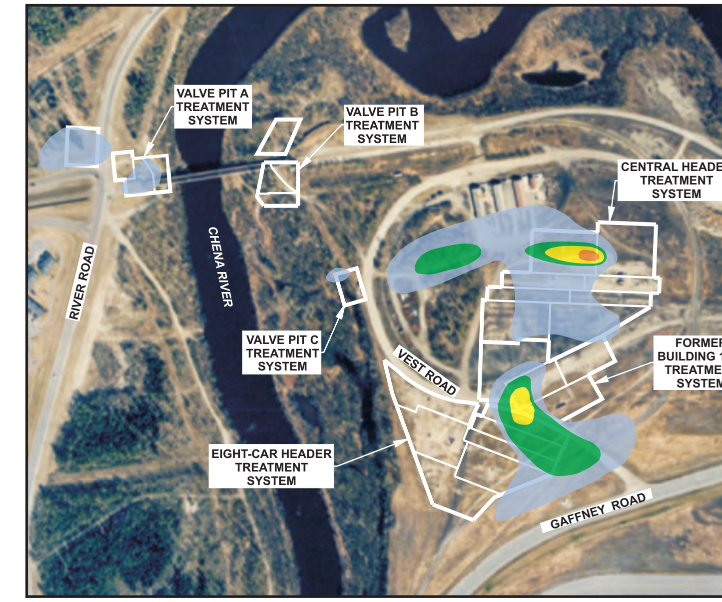
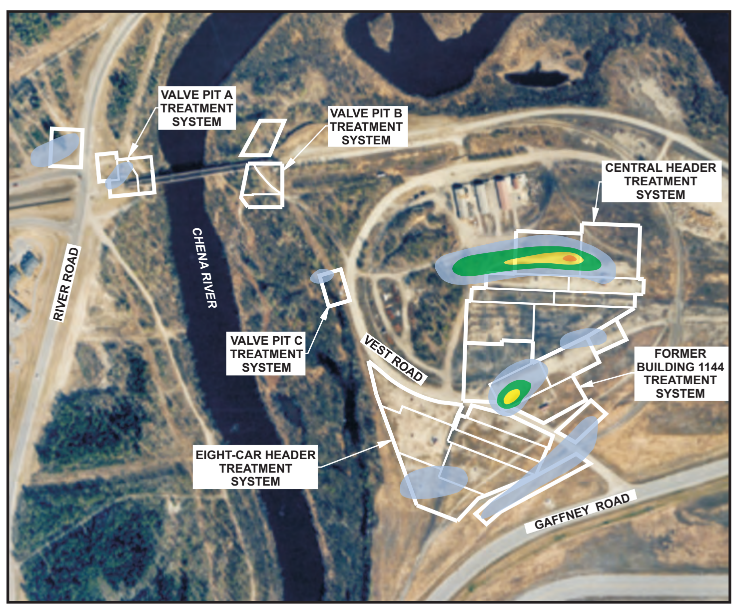
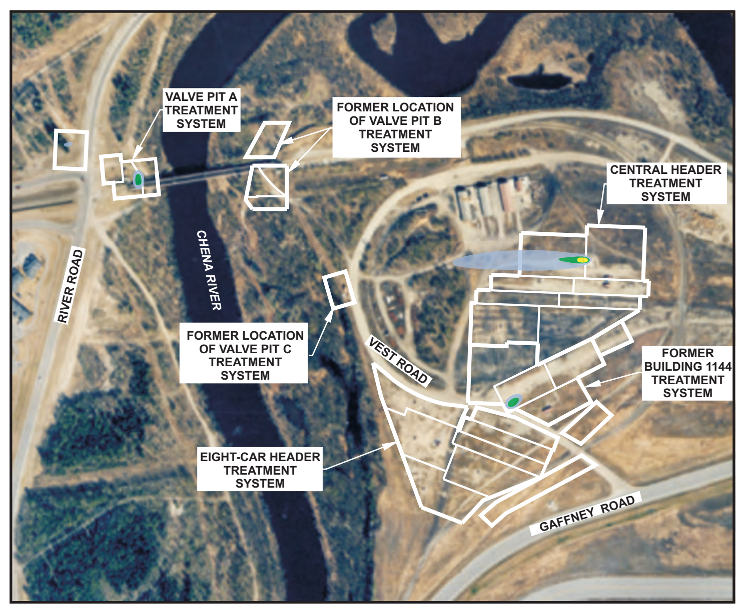


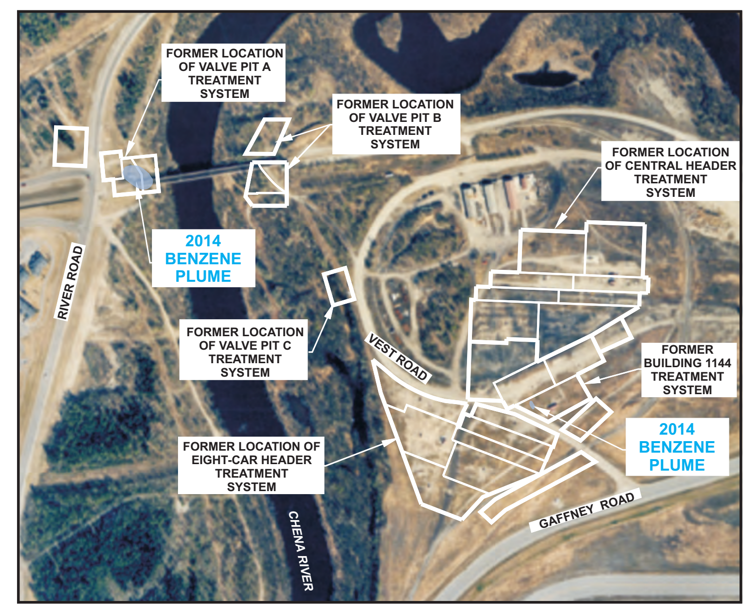
2001



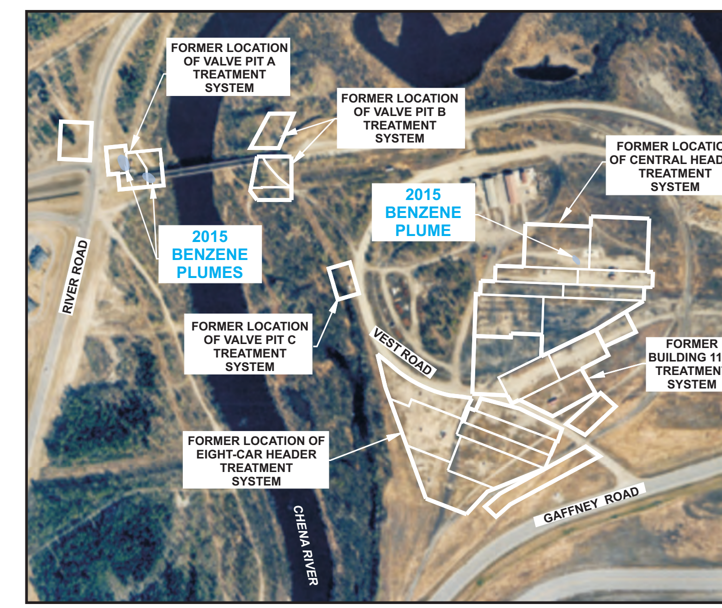
2004



2007



2014



2015

NOTES:

1. HIGHEST YEARLY CONCENTRATIONS SHOWN ON MAP.
2. PREVIOUS YEARS CONTAMINANT PLUMES MODIFIED BASED ON NEW MONITORING WELL POINTS AND REEVALUATION OF PAST DATA.
3. DRAWINGS ARE CONCEPTUAL AND ARE BASED ON EVALUATION OF AVAILABLE INFORMATION.

LEGEND

μg/L MICROGRAMS PER LITER

APPROXIMATE EXTENT OF BENZENE PLUME ABOVE REMEDIAL ACTION GOAL OF 5 μg/L

APPROXIMATE EXTENT OF BENZENE PLUME WITH CONCENTRATIONS ABOVE 50 μg/L

APPROXIMATE EXTENT OF BENZENE PLUME WITH CONCENTRATIONS ABOVE 100 μg/L

APPROXIMATE EXTENT OF BENZENE PLUME WITH CONCENTRATIONS ABOVE 1,000 μg/L

APPROXIMATE EXTENT OF PRODUCT PLUME

NORTH

0 800 1,600

Scale in Feet

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Benzene Plume Reduction at the Railcar Offloading Facility

2015 Monitoring Report
Operable Unit 3
Fort Wainwright, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-12-D-0001	3-4	4/16

307C FIGURE 3-4

VPA-MP2 12-20 bgs

VPA-MP2 12-20 bgs	OCT 1996	OCT 1997	JULY 1998	OCT 1998	MAR 1999	AUG 1999	MAY 2000	AUG 2000	MAY 2001	AUG 2001	MAR 2002	SEPT 2002	APRIL 2003	OCT 2003	DEC 2003	MAR 2004	SEPT 2004	APRIL 2005	SEPT 2005	APRIL 2006	SEPT 2006	APRIL 2007
DCA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(5)	ND(1)	ND(1)	ND(1)	ND(10)	ND(2)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(1)	ND(1)
EDB	ND(1)	NA	ND(10)	ND(1)	ND(1)	ND(0.010)	ND(1)	ND(1)	ND(1)	ND(5)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
BENZENE	4,300	200	379	160	36.5	5.9	33.3	36.8	36.7	19.7	69.1	ND(0.5)	13.7	ND(0.4)	0.9	2.2	93.5	165	40.5	11.4	3.7	ND(1)
TOLUENE	13,000	1,400	1,695	1,285	372	104	135	237	210	109	254	40.6	289	ND(1)	62.8	206	412	598	11.7	143	3.1	0.61
EBZ	620	45	ND(1)	45	17.6	14	9.57	31.0	19	13.4	11.1	3.04	15.9	ND(1)	6.29	13.2	45.8	74.3	11.8	19.3	1.8	0.49
DRO																						
GRO																						
WATER ELEV.	427.29	NM	427.07	428.23	426.44	428.02	428.54	427.83	427.09	428.99	426.46	428.89	426.97	429.09	427.77	427.18	426.74	426.74	427.50	426.74	427.86	427.39

VPA-MP2 12-20 bgs	AUG 2007	MAY 2008	AUG 2008	APRIL 2009	SEPT 2009	JULY 2010	SEPT 2010	NOV 2010	JUNE 2011	OCT 2011	OCT 2012	MAY 2013	OCT 2014
DCA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(10)	ND(4)	ND(1)	ND(0.2)	ND(0.2)	ND(0.15)
EDB	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(20)	ND(4)	ND(1)	ND(0.2)	ND(0.2)	ND(0.2)
BENZENE	0.42	0.24	0.13	7.4	2.7	37	24	40	9	3.1	1.9	1.2	16
TOLUENE	0.52	26	9.0	160	5.1	28	35	190	21	32	0.91	3.5	14
EBZ	0.93	5.2	2.7	22	1.9	7.4	7.4	34	8.6	5.8	3.6	5.9	29
DRO				10,000	NA	59,000	16,000	12,000	13,000	22,000	20,000	18,000	12,000
GRO				4,500	NA	1,600	830	2,500	2,300	3,600	600	470	1,300
WATER ELEV.	429.01	427.32	430.16	426.17	428.60	427.19	427.66	426.49	429.31	428.39	427.47	430.80	428.11

VPA-MP1 12-20 bgs

VPA-MP1 12-20 bgs	AUG 1996	JULY 1998	OCT 1998	MARCH 1999	AUG 1999	FEB 2000	MAY 2000	MAY 2001	AUG 2001	MAR 2002	SEPT 2002	APRIL 2003	OCT 2003	DEC 2003
DCA	3	ND(1)	NA	ND(20)	ND(10)	ND(100)	ND(1)	ND(1)	ND(10)	ND(2)	ND(1)	ND(1)	ND(5)	ND(1)
EDB	ND(1)	NA	NA	ND(20)	ND(0.020)	ND(100)	ND(1)	ND(1)	ND(5)	ND(1)	ND(1)	ND(1)	ND(5)	ND(1)
BENZENE	6,200	3,900	1,080	1,230	330	366	7.04	ND(1)	0.58	ND(0.5)	ND(0.5)	ND(0.4)	ND(0.2)	ND(0.4)
TOLUENE	16,000	25,800	12,500	16,100	4,720	12,800	148	3.4	7.5	24.2	2.31	ND(1)	50.7	65.8
EBZ	ND(1)	1,250	423	573	257	320	4.23	1.04	ND(5)	ND(1)	ND(1)	ND(1)	ND(5)	3.43
DRO														
GRO														
WATER ELEV.	427.13	426.06	427.27	425.52	427.02	NM	NM	427.26	NM	NM	427.12	426.05	427.13	427.72

VPA-MP1 12-20 bgs	MAR 2004	SEPT 2004	APRIL 2005	SEPT 2005	APRIL 2006	SEPT 2006	APRIL 2007	AUG 2007	APRIL 2008	AUG 2008	APRIL 2009	SEPT 2009	JULY 2010	SEPT 2010	NOV 2010	JUNE 2011	OCT 2011	OCT 2012	MAY 2013	OCT 2014
DCA	ND(10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(10)	ND(1)	ND(1)	ND(0.2)	ND(0.2)	ND(0.15)
EDB	ND(10)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(20)	ND(1)	ND(1)	ND(0.2)	ND(0.2)	ND(0.2)
BENZENE	ND(0.4)	ND(0.4)	ND(0.4)	0.99	0.71	0.3	ND(1)	ND(1)	ND(1)	ND(1)	0.42	0.15	0.79	ND(1.3)	ND(10)	0.29	2.6	1.2	0.55	140
TOLUENE	129	2.11	ND(1)	0.92	1.92	2.3	0.28	0.22	0.19	0.087	1.2	ND(1)	1.7	ND(2.5)	ND(10)	0.48	0.65	1.4	0.51	0.48
EBZ	ND(10)	ND(1)	ND(1)	ND(1)	0.91	0.28	0.21	0.13	0.12	0.18	0.43	0.13	0.53	ND(1)	ND(10)	ND(1)	0.19	ND(0.2)	ND(0.2)	0.21
DRO											12,000	NA	34,000	6,600	8,400	21,000	12,000	14,000	12,000	15,000
GRO											920	NA	1,100	1,000	670	150	220	990	150	680
WATER ELEV.	427.06	425.88	427.35	426.52	425.78	426.81	425.44	427.38	426.26	429.16	425.01	427.54	426.12	426.60	425.43	428.18	427.38	426.26	429.24	427.03

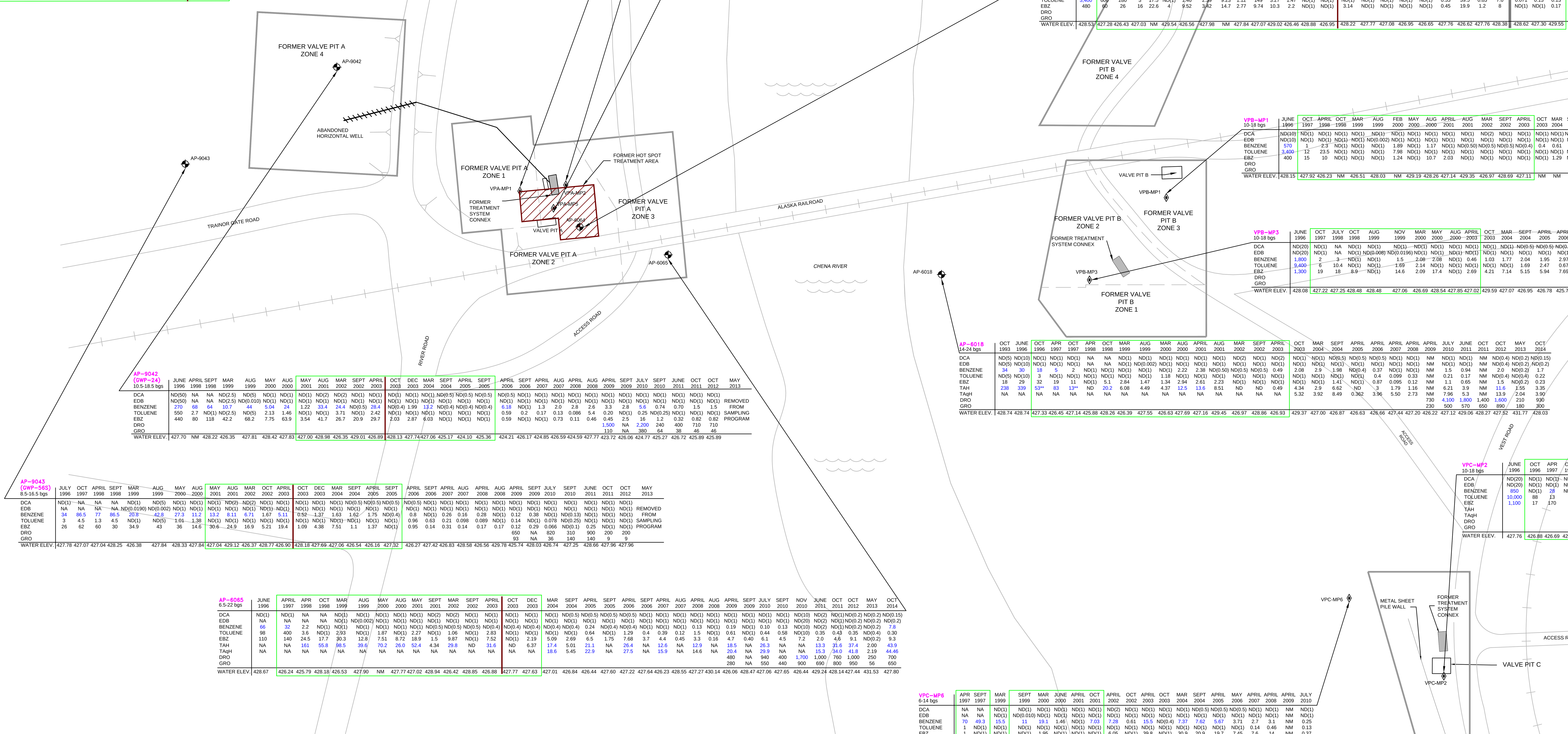
VPA-MP5 13-23 bgs

VPA-MP5 13-23 bgs	AUG 2007	MAY 2008	AUG 2008	APRIL 2009	SEPT 2009	JULY 2010	SEPT 2010	NOV 2010	JUNE 2011	OCT 2011	OCT 2012	MAY 2013	OCT 2014
DCA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(10)	ND(5)	ND(1)	ND(0.2)	ND(0.2)	ND(0.15)
EDB	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(20)	ND(5)	ND(1)	ND(0.2)	ND(0.2)	ND(0.2)
BENZENE	0.36	21	ND(1)	0.92	2.1	2.5	2.1	2.1	9.6	25	28	13	45
TOLUENE	0.46	310	0.14	0.56	0.75	3.1	1.5	6.8	64	72	2.1	3.8	2.9
EBZ	2.6	0.12	0.21	0.31	1	1.7	4.4	4.2	4.8	6	11	6.6	15
DRO				5,600	NA	31,000	6,300	25,000	14,000	11,000	26,000	10,000	23,000
GRO				230	NA	430	720	22,000	9,700	2,000	9,800	1,300	1,400
WATER ELEV.	434.17	432.89	435.30	431.27	428.68*	427.20	427.69	426.50	429.17	428.41	427.47	430.81	428.15

AP-6064 6.5-22 bgs

AP-6064 6.5-22 bgs	JUNE 1996	OCT 1996	APR 1997	OCT 1997	APR 1998	OCT 1998	MAR 1999	AUG 1999	MAY 2000	AUG 2000	MAY 2001	AUG 2001	MAR 2002	SEPT 2002	APRIL 2003
DCA	ND(20)	ND(1)	ND(1)	ND(1)	NA	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(2)	ND(2)	ND(1)	ND(1)
EDB	ND(20)	ND(1)	ND(1)	NA	NA	NA	ND(1)	ND(0.010)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
BENZENE	1,300	26	180	2	57.4	ND(1)	21.7	ND(1)	28.8	2.95	184	61.1	14.7	ND(0.5)	ND(0.4)
TOLUENE	3,400	600	280	3	17.5	ND(1)	1.46	2.39	9.23	1.12	149	3.27	1.47	ND(1)	ND(1)
EBZ	480	60	26	16	22.6	4	9.52	3.42	14.7	2.77	9.74	10.3	2.2	ND(1)	ND(1)
DRO															
GRO															
WATER ELEV.	428.53	427.28	426.43	427.03	NM	429.54	426.56	427.98	NM	427.84	427.07	429.02	426.46	428.88	426.95

AP-6064 6.5-22 bgs	OCT 2003	DEC 2003	MAR 2004	SEPT 2004	APRIL 2005	SEPT 2005	APRIL 2006	SEPT 2006	APRIL 2007	AUG 2007	MAY 2008	AUG 2008	APRIL 2009	SEPT 2009	JULY 2010	SEPT 2010	NOV 2010	JUNE 2011	OCT 2011	OCT 2012	MAY 2013	OCT 2014
DCA	ND(1)	ND(1)	ND(1)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(10)	ND(1)	ND(1)	ND(0.2)	ND(0.2)	ND(0.15)
EDB	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(20)	ND(1)	ND(1)	ND(0.2)	ND(0.2)	ND(0.2)
BENZENE	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	2.27	29.8	176	5.9	65	ND(1)	ND(1)	ND(1)	2.3	14	11	7.5	36	3.8	3.6	3.9	0.73	9
TOLUENE	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	0.33	39.5	0.83	7.6	0.071	0.13	0.13	0.31	ND(1)	0.91	0.71	75	7.1	0.97	0.28	ND(0.4)	0.48
EBZ	3.14	ND(1)	ND(1)	ND(1)	ND(1)	0.45	19.9	1.2	8	ND(1)	ND(1)	0.17	2.1	0.54	10	2.5	17	9.9	2.2	0.6	0.34	0.41
DRO													980	NA	3,200	680	4,800	2,500	2,800	1,600	500	4,000
GRO													56	NA	270	120	1,000	510	98	43	36	41
WATER ELEV.	428.22	427.77	427.08	426.95	426.65	427.76	426.62	427.76	428.38	428.62	427.30	429.55	426.18	428.61	427.15	427.65	426.50	429.33	428.35	427.42	430.94	428.06



THE GREEN BOX REPRESENTS GROUNDWATER SAMPLING EVENTS CONDUCTED WHEN THE TREATMENT SYSTEM ZONE WAS OPERATING

OPERATIONAL HISTORY:

BROWN LINES REPRESENT THE TIME FRAME FOLLOWING AIR SPARGE PROBE REHABILITATION

BLACK LINES REPRESENT WHEN THE HOT SPOT TREATMENT BEGAN

VALVE PIT A

1. TREATMENT SYSTEM OPERATION INITIATED 1996
2. ZONE 4 AND HORIZONTAL WELL INSTALLED IN 2000
3. SHUTDOWN ZONES 1 AND 3 IN 2004 TO CONDUCT A REBOUND STUDY
4. SHUTDOWN ZONE 4 AND HORIZONTAL WELL IN 2005 TO CONDUCT A REBOUND STUDY
5. HOT SPOT OPERATION BEGAN IN 2007
6. SHUTDOWN ZONE 2 AND HOT SPOT IN 2009 TO CONDUCT A REBOUND STUDY
7. DECOMMISSIONED ZONE 4 IN 2009 AND ZONES 1-3 IN 2013.

VALVE PIT B

1. TREATMENT SYSTEM OPERATION INITIATED 1996
2. SHUTDOWN ZONE 1 IN 2003 TO CONDUCT A REBOUND STUDY
3. SHUTDOWN TREATMENT SYSTEM IN 2003 TO CONDUCT A REBOUND STUDY
4. DECOMISSIONED TREATMENT SYSTEM IN 2005

VALVE PIT C

1. TREATMENT SYSTEM OPERATION INITIATED 1996
2. SHUTDOWN TREATMENT SYSTEM IN 1998 TO CONDUCT A REBOUND STUDY
3. SYSTEM WAS RESTARTED IN 1999 DUE TO REBOUNDING CONTAMINANTS
4. SHUTDOWN TREATMENT SYSTEM IN 2001 TO CONDUCT A REBOUND STUDY
5. DECOMISSIONED TREATMENT SYSTEM IN 2005
6. VPC MP-6 DECOMMISSIONED DUE TO BROKEN RISER 2011

LEGEND:

AP-6064	MONITORING WELL
VPC-MP6	GROUNDWATER PROBE
bgs	BELOW GROUND SURFACE
DCA	1,2-DICHLOROETHANE
EDB	1,2-DIBROMOETHANE
EBZ	ETHYLBENZENE
LOD	LIMIT OF DETECTION
LOQ	LIMIT OF QUANTITATION
NA	ANALYSIS NOT PERFORMED
ND	DETECTION LIMIT (LOD IN PARENTHESE FOR DATA PRIOR TO 2012; LOD IN PARENTHESES FOR DATA STARTING IN 2012)
NM	NOT MEASURED
* *	THE TAH RESULT FOR THIS SAMPLE DOES NOT INCLUDE XYLENE CONCENTRATIONS
TAH	TOTAL AROMATIC HYDROCARBONS
TAqH	TOTAL AQUEOUS HYDROCARBONS

KEY:

MONITORING WELL

SCREENED INTERVAL DEPTH IN FEET bgs

AP-6064 8.5-16.5 bgs	JUNE 1996	OCT 1996	APR 1997
DCA	ND(20)	ND(1)	ND(1)
EDB	ND(20)	ND(1)	ND(1)
BENZENE	1,300	26	180
TOLUENE	3,400	600	280
EBZ	480	60	26
WATER ELEVATIONS	428.53	427.28	426.43

CONCENTRATIONS EXCEEDING APPLICABLE STANDARD SHOWN IN BLUE

CONCENTRATIONS IN MICROGRAMS PER LITER µg/L

ELEVATIONS IN FEET MEAN SEA LEVEL (NGVD '29 DATUM)

NOTES:

1. VALVE PITS B AND C WERE DECOMMISSIONED IN 2005. VALVE PIT A VAPOR EXTRATION SYSTEM WAS TURNED ON IN MAY 2008 THEN TURNED OFF IN OCTOBER 2008.
2. ONLY SPRING AND FALL SAMPLE RESULTS ARE PRESENTED.
3. * REPLACEMENT WELLS WERE INSTALLED IN SEPTEMBER 2004. RESULTS FROM SEPTMEBER 2004 AND AFTER ARE FROM SAMPLES COLLECTED FROM REPLACEMENT WELLS. ALL OTHER RESULTS ARE FROM THE GROUNDWATER PROBE SHOWN IN PARENTHESES.
4. BEGINNING IN 2006 TAH AND TAQH CONCENTRATIONS WERE CALCULATED USING HALF THE REPORTING LIMIT FOR ND ANALYTES. PREVIOUS CONCENTRATIONS MAY NOT INCLUDE ESTIMATES FOR ND ANALYTES.
5. VALVE PIT B AND VALVE PIT C VOC SAMPLING WAS NOT CONDUCTED IN 2009 PER RPM DECISION DECEMBER 2008.
6. DATA FLAGS (QUALIFIERS) ARE NOT SHOWN DUE TO SPACE LIMITATIONS.
7. STARTING IN 2010, THE HIGHEST CONCENTRATION BETWEEN PRIMARY AND DUPLICATE SAMPLES IS SHOWN FOR WELLS WHERE DUPLICATE SAMPLES WERE COLLECTED.

REMEDIAL ACTION GOALS IN µg/L

5	DCA
0.05	EDB
5	BENZENE
1,000	TOLUENE
700	EBZ

ADEC GROUNDWATER CLEANUP LEVELS IN µg/L

1,500	DRO
2,200	GRO

AWQS IN µg/L

10	TAH
15	TAqH

NORTH

0 60 120

Scale in Feet

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Groundwater Concentrations at the Valve Pits A, B, and C

2014 Monitoring Report
Operable Unit 3
Fort Wainwright, Alaska

CONTRACT: W911KB-12-D-0001 | FIGURE: 3-1 | DATE: 6/15

Table 3-1 - Groundwater Sample Field-Screening and Analytical Results
Valve Pits A, B, and C

Probe/Well Number	Sample Number	Sample Date	Survey Elevation	Water Level (ft BTOC)	Water Elevation (ft msl)	Dissolved Oxygen (mg/L)	Iron II (mg/L)	Sulfate (mg/L)	DRO (µg/L)	GRO (µg/L)	ROD Contaminants of Concern (µg/L) Benzene	Toluene	Ethylbenzene	1,2,4-Trimethyl-benzene	1,3,5-Trimethyl-benzene	1,2-Dichloro-ethane	1,2-Dibromo-ethane[2]	TAH[3]	TAqH[3]
CLEANUP LEVELS									**1,500**	**2,200**	**5**	**1,000**	**700**	**1,850**	**1,850**	**5**	**0.05**	**10**	**15**
Valve Pit A																			
VPA-MP1	10FWD03WG	7/1/2010	442.23	16.11	426.12	0.39	NA	NA	**34,000**	1,100	0.79 J	1.7	0.53 J	5.9	9.9	ND(1)	ND(1)	NA	NA
	10FWD12WG	9/13/2010	442.23	15.63	426.60	0.43	NA	NA	**6,600 QH**	1,000	ND(1.3)	ND(2.5)	ND(1)	5.6 J	11	ND(1)	ND(1)	NA	NA
	10FWD19WG	11/9/2010	442.23	16.80	425.43	1.28	41.5	8.3	**8,400 QH**	670	ND(10)	ND(10)	ND(10)	4.9 J	7.1 J	ND(10)	ND(20)	NA	NA
	11FW3D05WG	6/28/2011	442.23	14.05	428.18	7.04	8	26	**21,000**	150	0.29 J	0.48 J	ND(1)	0.86 J	1.3	ND(1)	ND(1)	NA	NA
	11FW3D09WG	10/3/2011	442.23	14.85	427.38	2.81	19	50	**12,000**	220	2.6	0.65 J	0.19 J	3.4	5.9	ND(1)	ND(1)	NA	NA
	12FW3D04WG	10/2/2012	442.23	15.97	426.26	1.18	67	13	**14,000**	990	1.2	1.4	ND(0.2)	9.9	16	ND(0.2)	ND(0.2)	NA	NA
	13FW3D04WG	5/28/2013	442.23	12.99	429.24	0.48	9	9.3	**12,000**	150	0.55 J	0.51 J	ND(0.2)	1.5	1.7	ND(0.2)	ND(0.2)	NA	NA
	14FWOU391WG	10/24/2014	442.23	15.20	427.03	0.88	25.5 J-	43.7	**15,000**	680	**140**	0.48 J	0.21 J	8.2	11	ND (0.15)	ND(0.2)	NA	NA
VPA-MP2	10FWD05WG	7/1/2010	442.19	15.00	427.19	0.51	NA	NA	**59,000**	1,600	**37**	28.0	7.4	39	15	ND(1)	ND(1)	NA	NA
	10FWD13WG	9/13/2010	442.19	14.53	427.66	0.22	NA	NA	**16,000 QH**	830	**24**	35.0	7.4	13	6.5	ND(1)	ND(1)	NA	NA
	10FWD20WG	11/9/2010	442.19	15.70	426.49	0.71	NA	NA	**12,000 QH**	**2,500**	**40**	190.0	34	84	53	ND(10)	ND(20)	NA	NA
	11FW3D04WG	6/27/2011	442.19	12.88	429.31	5.33	5.9	98	**13,000**	**2,300**	**9**	21.0	8.6	170	84	ND(4)	ND(4)	NA	NA
	11FW3D10WG	10/3/2011	442.19	13.80	428.39	1.92	7.3	150	**22,000**	**3,600**	3.1	32.0	5.8	220	120	ND(1)	ND(1)	NA	NA
	12FW3D02WG	10/2/2012	442.19	14.72	427.47	1.31	10	32	**20,000**	600	1.9	0.91 J	3.6	27	36	ND(0.2)	ND(0.2)	NA	NA
	13FW3D02WG	5/28/2013	442.19	11.39	430.80	1.24	1.8	27	**18,000**	470	1.2	3.5	5.9	17	12	ND(0.2)	ND(0.2)	NA	NA
	14FWOU394WG	10/24/2014	442.19	14.08	428.11	0.48	11.3 J-	8.6	**12,000**	1,300	**16**	14.0	29	55	32	ND (0.15)	ND(0.2)	NA	NA
AP-6064	10FWD06WG	7/1/2010	444.6	17.45	427.15	0.15	NA	NA	**3,200**	270	**11**	0.91 J, B	10	14	4.8	ND(1)	ND(1)	NA	NA
	10FWD17WG	9/13/2010	444.6	16.95	427.65	0.76	NA	NA	680	120	**7.5**	0.71 J	2.5	2.4	0.84	ND(1)	ND(1)	NA	NA
	10FWD22WG	11/10/2010	444.6	18.10	426.50	0.99	NA	NA	**2,500 QH,Q**	1,000 M	**36**	75	17	34	16	ND(10)	ND(20)	NA	NA
	10FWD23WG[4]	11/10/2010	444.6	18.10	426.50	0.99	NA	NA	**4,800 QH**	1,000	**32**	65	17	34	16	ND(10)	ND(20)	NA	NA
	11FW3D03WG	6/27/2011	444.6	15.27	429.33	4.06	0.13	55	**2,500**	510	3.8	7.1	9.9	17	9.1	ND(1)	ND(1)	NA	NA
	11FW3D12WG	10/3/2011	444.6	16.25	428.35	1.96	0.056 J	67	**2,800**	98	3.6	0.97 J	2.2	3.3	1.7	ND(1)	ND(1)	NA	NA
	12FW3D01WG	10/2/2012	444.6	17.18	427.42	1.51	0.054 J	25	**1,600**	43	3.9	0.28 J	0.6 J	0.83 J	0.45 J	ND(0.2)	ND(0.2)	NA	NA
	13FW3D01WG	5/28/2013	444.6	13.66	430.94	1.67	0.039 J	15	500	36	0.73 J	ND(0.4)	0.34 J	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	NA	NA
	14FWOU396WG	10/24/2014	444.6	16.54	428.06	1.2	0.137	34.3	**4,000**	41 J	**9**	0.48 J	0.41 J	0.92 J	0.20 J	ND (0.15)	ND(0.2)	NA	NA
AP-6065	10FWD07WG	7/1/2010	443.24	16.18	427.06	0.22	NA	NA	930 J	550	0.10 J	0.44 J, B	6.1	39 J	12	ND(1)	ND(1)	**26.3**	**29.9**
	10FWD08WG[4]	7/1/2010	443.24	16.18	427.06	0.22	NA	NA	940	430	ND(1) Q	0.32 J, B, Q	5.5	36	12	ND(1)	ND(1)	**24.9**	**28.42**
	10FWD14WG	9/13/2010	443.24	15.59	427.65	0.19	5.94	3.3	400	440	0.13 J	0.58 J	4.5	26	6.8	ND(1)	ND(1)	NA	NA
	10FWD18WG	11/9/2010	443.24	16.80	426.44	19.25	NA	NA	**1,700 QH**	900	ND(10)	ND(10)	7.2 J, QH	57 QH	25 QH	ND(10)	ND(20)	NA	NA
	11FW3D07WG	6/28/2011	443.24	14.00	429.24	5.78	0.48	51	990	690 QL	ND(2)	0.35 J	2	20	17	ND(2)	ND(2)	**13.2**	14.7
	11FW3D08WG[4]	6/28/2011	443.24	14.00	429.24	5.78	0.54	51	1,000	730 QL	ND(2)	ND(2)	1.9 J	20	18	ND(2)	ND(2)	**13.3**	**15.3**
	11FW3D15WG	10/4/2011	443.24	15.10	428.14	1.89	0.61	31	760	800 J, ML	ND(1)	0.43 J	4.6	40	23	ND(1)	ND(1)	**31.6**	**33.2**
	11FW3D16WG[4]	10/4/2011	443.24	15.10	428.14	1.89	0.6	31	730	810	ND(1)	0.38 J	4.6	40	24	ND(1)	ND(1)	**31.4**	**34.0**
	12FW3D05WG	10/2/2012	443.24	15.80	427.44	0.28	0.076 J	28	1,000	920	ND(0.2)	0.35 J	9.1	56	30	ND(0.2)	ND(0.2)	**37.4**	**41.8**
	12FW3D06WG[4]	10/2/2012	443.24	15.80	427.44	0.28	0.073 J	28	1,000	950	ND(0.2)	0.33 J	8.2	48	27	ND(0.2)	ND(0.2)	**32.8**	**37.3**
	13FW3D05WG	5/29/2013	443.24	11.71	431.53	6.22	0.52 J	11	250	43	ND(0.2)	ND(0.4)	ND(0.2)	0.59 J	0.64 J	ND(0.2)	ND(0.2)	2.00	2.19
	13FW3D06WG[4]	5/29/2013	443.24	11.71	431.53	6.22	0.58 J	11	230 J	56	ND(0.2)	ND(0.4)	ND(0.2)	0.59 J	0.63 J	ND(0.2)	ND(0.2)	2.00	2.19
	14FWOU392WG	10/24/2014	443.24	15.44	427.80	0.33	0.724	11.5	690 J,J-	650	**7.8 J-**	0.28 J	8.8 J,J-	62 J	22	ND (0.15)	ND(0.2)	**42.48**	**43.29**
	14FWOU393WG[4]	10/24/2014	443.24	15.44	427.80	0.33	0.751	10.1	700 J,J-	540	**7.6 J-**	0.30 J	9.3 J,J-	66	23	ND (0.15)	ND(0.2)	**43.9**	**44.46**
AP-9042[1] (GWP-24)	10FWD01WG	6/30/2010	443.12	18.35	424.77	0.15	NA	NA	**2,200**	380 B	**5.6 QH**	0.25 J, B, QH	16 QH	42.0 QH	9.1 QH	ND(1)	ND(1)	NA	NA
	10FWD09WG	9/13/2010	443.12	17.85	425.27	0.47	4.17	10.6	220	64 Q	0.74 J	ND(1)	1.2	2.7	0.23 J, Q	ND(1)	ND(2)	NA	NA
	10FWD10WG[4]	9/13/2010	443.12	17.85	425.27	0.47	NA	NA	240	41 J	0.65 J	ND(1)	0.93 J	2.3	0.16 J	ND(1)	ND(2)	NA	NA
	11FW3D01WG	6/27/2011	443.12	16.40	426.72	7.4	1.3	10	400	38	0.7 J	ND(1)	0.32 J	1.0	ND(1)	ND(1)	ND(1)	NA	NA
	11FW3D13WG	10/4/2011	443.12	17.23	425.89	2.59	5.3	7.7	710	46	1.5	ND(0.4)	0.82 J	3.3	ND(1)	ND(0.2)	ND(0.2)	NA	NA
AP-9043[1] (GWP-56S)	10FWD02WG	7/1/2010	441.68	14.94	426.74	0.29	NA	NA	820 QL	36 J, B	ND(1) QL	0.078 J, B, QL	0.066 J, B, QL	0.46 J, QL	ND(1) QL	ND(1) QL	ND(1) QL	NA	NA
	10FWD11WG	9/13/2010	441.68	14.43	427.25	0.24	NA	NA	310	140 QH	ND(0.13)	ND(0.25)	ND(0.1)	ND(0.12)	ND(0.14)	ND(1)	ND(1)	NA	NA
	11FW3D02WG	6/27/2011	441.68	13.02	428.66	4.14	6	11	900	140	ND(1)	ND(1)	0.25 J	0.76 J	ND(1)	ND(1)	ND(1)	NA	NA
	11FW3D14WG	10/4/2011	441.68	13.72	427.96	3.49	ND(0.1)	37	200 J	9 J, B	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	NA	NA
VPA-MP5	10FWD04WG	7/1/2010	442.52	15.32	427.20	0.53	NA	NA	**31,000**	430	2.5	3.1	1.7	15	12	ND(1)	ND(1)	NA	NA
	10FWD16WG	9/13/2010	442.52	14.83	427.69	0.43	NA	NA	**6,300 QH**	720	2.1	1.5	4.4	28	18	ND(1)	ND(1)	NA	NA
	10FWD21WG	11/10/2010	442.52	16.02	426.50	14.2	NA	NA	**25,000 QH**	**22,000**	2.1 J, QH	6.8 J, QH	4.2 J, QH	69 QH	60 QH	ND(10)	ND(20)	NA	NA
	11FW3D06WG	6/28/2011	442.52	13.35	429.17	4.94	1.8	190	**14,000 QL**	**9,700**	**9.6**	64	4.8 J	40	41	ND(5)	ND(5)	NA	NA
	11FW3D11WG	10/3/2011	442.52	14.11	428.41	1.63	3.2	90	**11,000**	2,000	**25**	72	6	35	38	ND(1)	ND(1)	NA	NA
	12FW3D03WG	10/3/2012	442.52	15.05	427.47	1.1	21	1.5 J	**26,000**	**9,800**	**28**	2.1	11	41	34	ND(0.2)	ND(0.2)	NA	NA
	13FW3D03WG	5/28/2013	442.52	11.71	430.81	0.29	15	0.92 J	**10,000**	1,300	**13**	3.8	6.6	37	33	ND(0.2)	ND(0.2)	NA	NA
	14FWOU395WG	10/24/2014	442.52	14.37	428.15	0.31	19.7 J-	4.9	**23,000**	1,400	**45**	2.9	15	78	53	ND (0.15)	ND(0.2)	NA	NA

Table 5-15 - Groundwater Sample Field-Screening and Analytical Results
Valve Pits A, B, and C

Probe/Well Number	Sample Number	Sample Date	Survey Elevation	Water Level (ft BTOC)	Water Elevation (ft msl)	Dissolved Oxygen (mg/L)	Iron II (mg/L)	Sulfate (mg/L)	DRO (µg/L)	GRO (µg/L)	ROD Contaminants of Concern (µg/L)								
											Benzene	Toluene	Ethylbenzene	1,2,4-Trimethyl-benzene	1,3,5-Trimethyl-benzene	1,2-Dichloro-ethane	1,2-Dibromo-ethane[2]	TAH[3]	TAqH[3]
CLEANUP LEVELS									**1,500**	**2,200**	**5**	**1,000**	**700**	**1,850**	**1,850**	**5**	**0.05**	**10**	**15**
Valve Pit B																			
VPB-MP3	10FWE01WG	7/1/2010	437.39	10.15	427.24	0.33	74	110	**17,000**	580 QH	2.3	0.27 J, B	8.2	35	19	ND(1)	ND(1)	NA	NA
	11FW3E03WG	6/29/2011	437.39	8.22	429.17	5.6	51	7.7	**7,100**	540	2.0	ND(1)	10.0	16	6.8	ND(1)	ND(1)	NA	NA
	11FW3E05WG	10/4/2011	437.39	8.99	428.40	0.47	NA	NA	**9,000**	550	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12FW3E02WG	10/2/2012	437.39	9.76	427.63	0.23	58	5.1	**11,000**	660	2.6	0.56 J	10	31	16	ND(0.2) Q	ND(0.2)	NA	NA
	12FW3E03WG[4]	10/2/2012	437.39	9.76	427.63	0.23	58	5.1	**10,000**	640	2.6	0.54 J	9.6	31	16	ND(0.4) Q	ND(0.4)	NA	NA
	13FW3E01WG	5/28/2013	437.39	6.20	431.19	0.4	45	24	**2,800**	500	1	0.23 J	3.4	12	4.2	ND(0.2)	ND(0.2)	NA	NA
	14FWOU398WG	10/24/2014	437.39	9.20	428.19	0.4	64.4	162	**5,800**	610	2	0.30 J	4.8	38	2.7	ND (0.15)	ND(0.2)	NA	NA
VPB-MP1	10FWE03WG	7/1/2010	440.69	NM	NM	0.54	NA	NA	**12,000 Q**	180 Q	0.39 J,Q	0.28 J,B,Q	0.54 J,Q	8 Q	15 Q	ND(1) Q	ND(0.02) Q	NA	NA
	11FW3E02WG	6/28/2011	440.69	NM	NM	1.47	53	11	**14,000**	410 QH	ND(2)	0.41 J	0.5 J	15	40	ND(2)	ND(2)	NA	NA
	11FW3E06WG	10/4/2011	440.69	NM	NM	1.66	NA	NA	**15,000**	330	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12FW3E01WG	10/2/2012	440.69	NM	NM	2.77	37	6.5	**4,200**	180	0.39 J	0.32 J	0.44 J	7.3	6.8	ND(0.4)	ND(0.4)	NA	NA
AP-6018	10FWE02WG	7/1/2010	437.52	10.40	427.12	0.72	NA	NA	**4,100**	500	1.5	0.21 J, B	1.1	9.9	2.5	ND(1)	ND(1)	6.21	7.96
	11FW3E01WG	6/29/2011	437.52	8.46	429.06	0.94	11	9	**1,800**	570 J	0.94 J	0.17 J	0.65 J	11 J	5.6 J ML	ND(1)	ND(1)	3.93	5.35
	11FW3E04WG	10/4/2011	437.52	9.25	428.27	0.57	NA	NA	1,400	650	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12FW3E04WG	10/2/2012	437.52	10.00	427.52	0.18	12 J	4.4 J	**1,600**	890 J	2	ND(0.4)	1.5 J	17	15	ND(0.4)	ND(0.4)	**11.6**	13.9
	13FW3E02WG	5/29/2013	437.52	5.75	431.77	0.23	5.3	14	210 J	180	ND(0.2)	ND(0.4)	ND(0.2)	1.8	1.8	ND(0.2)	ND(0.2)	1.55	2.04
	14FWOU397WG	10/24/2014	437.52	9.49	428.03	0.38	6.8	43.5	930	300	1.7	0.22 J	0.23 J	3.6	2.1	ND (0.15)	ND(0.2)	3.35	3.90
Valve Pit C																			
VPC-MP2	11FW3F01WG	6/28/2011	447.02	17.45	429.57	3.53	14	12	**2,300**	1,400	ND(4)	ND(4)	3.1 J	3.6 J	5.2	2.9 J	ND(4)	**17.8**	**19.2**
	11FW3F03WG	10/4/2011	447.02	18.39	428.63	0.73	NA	NA	**5,500**	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA
	11FW3F04WG[4]	10/4/2011	447.02	18.39	428.63	0.73	NA	NA	**5,500**	1,200	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12FW3F01WG	10/2/2012	447.02	19.15	427.87	0.17	18	9.5	**4,300**	1,200	ND(0.4)	ND(0.8)	7.8	18	ND(0.4)	ND(0.4)	ND(0.4)	**24.8**	**25.9**
	13FW3F01WG	5/29/2013	447.02	15.65	431.37	0.17	15	15	**1,800**	1,000	0.25 J	ND(0.4)	1.1	2	0.19 J	ND(0.2)	ND(0.2)	4.40	5.65
	14FWOU399WG	10/24/2014	447.02	18.50	428.52	0.83	20	61.3	**8,700**	1,900	0.53 J+	0.47 J,J+	22 J+	74 J+	9.4 J+	ND (0.15)	ND(0.2)	**101.60**	**115.60**
VPC-MP6	10FWF01WG	7/1/2010	434.37	6.85	427.52	0.29	61	0.48 J	**3,100**	400	0.25 J	0.13 J, B	0.37 J	14	2.7	ND(0.2)	ND(0.2)	**35.8**	**38.7**

Bold results represent concentrations in excess of remedial action goals

[1] Replacement wells installed in September 2004. Wells that were replaced are shown in parentheses.

[2] 1,2-Dibromoethane results were generated from either Method 8260 or Method 504.1. Results from Method 504.1 were used when available.

[3] For TAH and TAqH calculation purposes, the LOD was used for ND results. Prior to 2012, 1/2 the LOQ was used for ND results.

[4] Denotes sample is a field duplicate of preceding row.

DRO - diesel range organics
GRO - gasoline range organics
LOD - limit of detection
LOQ - limit of quantitation
µg/L - micrograms per liter
mg/L - milligram per liter
ft BTOC - feet below top of casing

msl - mean sea level
NA - not analyzed
NM - not measured
ROD - Record of Decision
TAH - total aromatic hydrocarbons
TAqH - total aqueous hydrocarbons

Data Qualifiers
B - analyte was detected in blank sample at similar concentration
J - result is estimated because it is less than the LOQ or due to a QC failure
J- or J+ - result is estimated with a high (+) or low (-) bias due to a QC failure (data starting in 2014)
ML or MH - result is estimated with a high (H) or low (L) bias due to matrix interference (data prior to 2014)
ND - detection limit (LOQ in parenthesis for data prior to 2012; LOD in parentheses for data starting in 2012)
QL or QH - result is estimated and biased high (H) or low (L) due to quality control failure (data prior to 2014)

AP-6006 9-24 bgs	OCT 1993	JUNE 1996	APR 1998	SEPT 1998	MARCH 1999	AUG 1999	MAR 2000	MAY 2002	APRIL 2003	MAR 2004	APRIL 2005	JUNE 2006	APRIL 2007	APRIL 2008	APRIL 2009	JUNE 2010	JUNE 2011	OCT 2011	OCT 2012	MAY 2013	OCT 2014	MAY 2015
DCA	ND(5)	ND(10)	NA	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(0.5)	ND(0.5)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NM	ND(0.2)	ND(0.2)	ND(0.15)	ND(0.15)
EDB	ND(5)	ND(10)	NA	NA	ND(1)	ND(0.002)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	NM	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)
BENZENE	2,900	1,100	1,240	87	ND(1)	ND(1)	ND(1)	ND(0.5)	12.9	30.9	ND(0.4)	2.27	3.3	1.6	2	2.4	1.4	NM	1.7	1.9	1.3	3.2
TOLUENE	3,400	580	388	9.9	ND(1)	1.14	ND(1)	ND(1)	10.8	33.8	ND(1)	0.31	0.27	0.13	0.54	0.33	ND(1)	NM	0.38	0.25	0.43	1.7
EBZ	590	310	148	13	ND(1)	ND(1)	2.05	ND(1)	34	62.5	ND(1)	0.87	3.1	1.9	7.6	7.6	2.5	NM	6.2	11.0	2.4	24
DRO															1,000	13,000	5,200	5,300	6,100	8,400	6,300	13,000
GRO															390	280	180	140	460	430	180	280
WATER ELEV	NM	428.77	426.69	429.68	426.93	428.68	427.28	431.91	427.86	427.68	427.32	430.18	427.65	427.16	426.91	428.10	429.45	429.15	428.28	428.80	429.03	428.89

THE GREEN BOX REPRESENTS GROUNDWATER SAMPLING EVENTS CONDUCTED AT MONITORING LOCATIONS WITHIN THE INFLUENCE OF AN TREATMENT SYSTEM ZONE

OPERATIONAL HISTORY:

BROWN LINES REPRESENT THE TIME FRAME FOLLOWING AIR SPARGE PROBE REHABILITATION

BLACK LINES REPRESENT WHEN THE HOT SPOT TREATMENT BEGAN

CENTRAL HEADER

1. TREATMENT SYSTEM OPERATION INITIATED IN 1996
2. ZONES 1, 2, 3, AND 4 INSTALLED IN 1997
3. ZONES 5 AND 6 INSTALLED IN 1998
4. ZONES 7 AND 8 INSTALLED IN 2000
5. SHUTDOWN ZONE 4 IN 2002 TO CONDUCT A REBOUND STUDY
6. SHUTDOWN ZONE 2 IN 2003 TO CONDUCT A REBOUND STUDY
7. SHUTDOWN ZONES 3 AND 8 IN 2004 TO CONDUCT A REBOUND STUDY
8. OPERATED ZONES 6 AND 7 AND AS ONLY IN SELECT PROBES IN ZONES 1, 3, AND 8 DURING 2005
9. SHUTDOWN ZONE 6 IN 2006
10. HOT SPOT OPERATION BEGAN IN 2007
11. SHUTDOWN SELECT PROBES IN ZONES 1 AND 8 IN 2008
12. SHUTDOWN ZONE 7 AND HOT SPOT 2010
13. TREATMENT SYSTEM DECOMMISSIONED 2013

FORMER BUILDING 1144

1. TREATMENT SYSTEM OPERATION INITIATED IN 1996
2. SYSTEM EXPANSION, ZONE 1, 2, 3, AND 4 INSTALLED IN 1997
3. ZONES 5 AND 6 INSTALLED IN 1997
4. ZONE 6 RELOCATED TO EIGHT CAR HEADER TREATMENT SYSTEM IN 1998 (FORMERLY ZONE 6 BUILDING 1144)
5. SHUTDOWN ZONE 5 IN2003 TO CONDUCT A REBOUND STUDY
6. SHUTDOWN ZONE 2 IN 2003 TO CONDUCT A REBOUND STUDY
7. SHUTDOWN ZONE 3 IN 2004 TO CONDUCT A REBOUND STUDY
8. ZONE 7 AND 8 EXPANSION BEGAN OPERATION IN 2004
9. NO CHANGE IN OPERATION FOR 2005
10. SHUTDOWN ZONE 6 IN 2006
11. SHUTDOWN ZONES 4, 7, AND 8 IN 2007. HOT SPOT OPERATION BEGAN IN 2007
12. SHUTDOWN ZONE 1 AND HOT SPOT AREA IN 2009 TO CONDUCT A REBOUND STUDY
13. TREATMENT SYSTEM DECOMMISSIONED 2012

EIGHT-CAR HEADER

1. TREATMENT SYSTEM OPERATION INITIATED IN 1998
2. ZONE 5 MOVED TO EIGHT-CAR IN 1998 (FORMERLY ZONE 6 BUILDING 1144)
3. SHUTDOWN TREATMENT SYSTEM IN 2002 TO CONDUCT A REBOUND STUDY
4. AIR SPARGE/VAPOR EXTRACTION WAS RESTARTED IN SELECT PROBES IN ZONES 1, 2, AND 3 IN 2004 DUE TO INCREASES IN CONTAMINANT CONCENTRATIONS. VAPOR EXTRACTION WAS DISCONTINUED IN JULY 2004 FOLLOWING FAILURE OF SVE BLOWER
5. EIGHT-CAR UPGRADIENT AREA ZONE 1 AND ZONE 2 BEGAN OPERATION IN 2004
6. SHUTDOWN ZONES 1, 2, AND 3 IN 2005 TO CONDUCT A REBOUND STUDY
7. NO CHANGE IN OPERATION IN 2006
8. NO CHANGE IN OPERATION IN 2007 OF EIGHT-CAR, SHUTDOWN UPGRADIENT AREA IN 2007
9. SHUTDOWN EIGHT-CAR TREATMENT SYSTEM IN 2008 TO CONDUCT A REBOUND STUDY
10. TREATMENT SYSTEMS DECOMMISSIONED 2012

KEY:

MONITORING WELL

SCREENED INTERVAL DEPTH IN FEET bgs

ELEVATIONS IN FEET MEAN SEA LEVEL (NGVD '29 DATUM OR NAVD88*)

GWP110 12-20 bgs	MAY 1997	MAR 1999	AUG 1999	JUNE 2000
DCA	NA	ND(10)	ND(1)	ND(5)
EDB	30	ND(10)	ND(0.01)	ND(5)
BENZENE	1,140	47.4	101	221
TOLUENE	180	17.9	37.9	56
WATER ELEV.	NM	427.33	429.29	429.88

CONCENTRATIONS EXCEEDING APPLICABLE STANDARD SHOWN IN BLUE

CONCENTRATIONS IN MICROGRAMS PER LITER (µg/L)

NOTES:

1. DUE TO SPACE LIMITATIONS, ANALYTICAL DATA FOR ONLY ONE SAMPLE EVENT PER YEAR BETWEEN 2000 AND 2010 IS SHOWN. SPRING / SUMMER DATA IS SHOWN OVER FALL / WINTER DATA BECAUSE CONCENTRATIONS ARE GENERALLY HIGHER.
2. *REPLACEMENT WELLS WERE INSTALLED IN AUGUST 2009. RESULTS FROM AUGUST 2009 AND AFTER ARE FROM SAMPLES COLLECTED FROM REPLACEMENT WELLS. ALL OTHER RESULTS ARE FROM THE GROUNDWATER PROBE SHOWN IN PARENTHESES.
3. DATA FLAGS (QUALIFIERS) ARE NOT SHOWN DUE TO SPACE LIMITATIONS.
4. STARTING IN 2010, THE HIGHEST CONCENTRATION BETWEEN PRIMARY AND DUPLICATE SAMPLES IS SHOWN FOR WELLS WHERE DUPLICATE SAMPLES WERE COLLECTED.
5. **REPLACEMENT WELLS WERE INSTALLED IN SPRING 2015. RESULTS FROM APRIL/MAY 2015 AND AFTER ARE FROM SAMPLES COLLECTED FROM REPLACEMENT WELLS. ALL OTHER RESULTS ARE FROM THE GROUNDWATER PROBE/WELL SHOWN IN PARENTHESES.

REMEDIAL ACTION GOALS IN µg/L

5	DCA
0.05	EDB
5	BENZENE
1,000	TOLUENE
700	EBZ

ADEC GROUNDWATER CLEANUP LEVELS IN µg/L

1,500	DRO
2,200	GRO

LEGEND:

AP-6006	MONITORING WELL
GWP130	GROUNDWATER PROBE
bgs	BELOW GROUND SURFACE
DCA	1,2-DICHLOROETHANE
EDB	1,2-DIBROMOETHANE
EBZ	ETHYLBENZENE
µG/L	MICROGRAMS PER LITER
LOD	LIMIT OF DETECTION
LOQ	LIMIT OF QUANTITATION
NA	ANALYSIS NOT PERFORMED
ND	DETECTION LIMIT (LOD IN PARENTHESIS FOR DATA PRIOR TO 2012; LOD IN PARENTHESIS FOR DATA STARTING IN 2012)
NM	NOT MEASURED

0 80 160
Scale in Feet

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Groundwater Concentrations at the Railcar Offloading Facility

2015 Monitoring Report
Operable Unit 3
Fort Wainwright, Alaska

CONTRACT: W911KB-12-D-0001 | FIGURE: 3-3 | DATE: 4/16

Table 5-16 - Groundwater Sample Field-Screening and Analytical Results
Central Header, Former Building 1144, and Eight-Car Header

Probe/Well Number	Sample Number	Sample Date	Survey Elevation	Water Level (ft BTOC)	Water Elevation (ft msl)	Dissolved Oxygen (mg/L)	Iron II (mg/L)	Sulfate (mg/L)	DRO (µg/L)	GRO (µg/L)	ROD Contaminants of Concern (µg/L)						
											Benzene	Toluene	Ethylbenzene	1,2,4-Trimethyl-benzene	1,3,5-Trimethyl-benzene	1,2-Dichloro-ethane	1,2-Dibromo-ethane[2]
CLEANUP LEVELS									**1,500**	**2,200**	**5**	**1,000**	**700**	**1,850**	**1,850**	**5**	**0.05**
Central Header																	
AP-10031[1] (GWP-13)	10FWG01WG	6/30/2010	448.58	20.35	428.23	0.49	NA	NA	170	800 QH	0.11 J,B	0.21 J,B	15	2.4	2.3	ND(1)	ND(0.010) QL
	10FWG15WG	9/9/2010	448.58	19.88	428.70	0.57	4.06	18.5	130	1700	ND(1)	ND(1)	0.67 J	0.99 J	ND(1)	ND(1)	ND(0.010)
	11FW3G01WG	6/22/2011	448.58	20.6	427.98	2.37	3.7	6.8	480	1,600	ND(1)	ND(1)	6	3.1	4	ND(1)	ND(0.020)
	11FW3G17WG	10/6/2011	448.58	19.34	429.24	0.89	NA	NA	200 J	1,500	NA	NA	NA	NA	NA	NA	NA
	12FW3G10WG	10/4/2012	448.58	20.06	428.52	0.19	5	15	66 J	1,500	ND(0.2)	ND(0.4)	5.4	0.95 J	0.52 J	ND(0.2)	ND(0.2)
	13FW3G07WG	5/28/2013	448.58	16.73	431.85	0.17	4.6	6.6	64 J	2,100 QH	ND(0.2)	ND(0.4)	0.37 J	3.7	0.84 J	ND(0.2)	ND(0.2)
	14FWOU373WG	10/23/2014	448.58	19.2	429.38	0.11	5.22	57.1	130 J	**3,000**	ND(0.5)	ND(0.5)	62	34	3.9 J	ND(0.75)	ND(1)
CH-MP2	10FWG02WG	6/30/2010	445.11	16.90	428.21	7.78	NA	NA	**11,000**	**2,500 QH**	2.2	4.6	11.0	550 QL	330	ND(1)	0.013 QL
	10FWG03WG[3]	6/30/2010	445.11	16.90	428.21	7.78	NA	NA	**11,000**	**3,000 QH**	2.1	4.8	11.0	510	290	ND(1)	0.01
	10FWG16WG	9/9/2010	445.11	16.46	428.65	0.45	NA	NA	**4,200 QH**	**3,300**	1.9 J	ND(1)	8.6	270	100	ND(1)	0.012
	11FW3G04WG	6/23/2011	445.11	15.68	429.43	6.14	15 J	5.2	**4,700**	1,700	1.9	5.4	8.9	190	130	ND(1)	0.0097 J
	11FW3G18WG	10/6/2011	445.11	15.93	429.18	0.71	NA	NA	**3,600**	**2,300**	NA	NA	NA	NA	NA	NA	NA
	12FW3G01WG	10/3/2012	445.11	16.4	428.71	0.27	35	2.8 J	**3,500**	**4,300**	1.8 J	3.4 J	7.2	270	200	ND(1)	ND(1)
	12FW3G02WG[3]	10/3/2012	445.11	16.4	428.71	0.27	35	2.8 J	**3,400**	**4,300**	2.0 J	3.6 J	7.6	280	210	ND(1)	ND(1)
	13FW3G08WG	5/29/2013	445.11	13.15	431.96	0.42	22	7.3	**1,700**	**2,300**	ND(0.2)	0.64 J,QH	2 QH	64 QH	50 QH	ND(0.2)	ND(0.2)
	13FW3G09WG[3]	5/29/2013	445.11	13.15	431.96	0.42	22	7.3	**1,700**	**2,400**	ND(0.2)	0.71 J,QH	2.2 QH	73 QH	53 QH	ND(0.2)	ND(0.2)
	14FWOU371WG	10/23/2014	445.11	15.59	429.52	1.71	23.1	39.8	**4,200**	1,700	0.43 J	0.96	4.0 J	170 J	110 J	0.16 J	ND(0.2)
	14FWOU372WG[3]	10/23/2014	445.11	15.59	429.52	1.71	25.8	39.4	**4,100**	1,800	0.42 J	1.1	4.5	200	130	0.20 J	ND(0.2)
GWP-2001C	10FWG04WG	6/30/2010	442.64	14.55	428.09	0.33	NA	NA	**15,000**	**2,100 QH**	0.95 J	1.5 B	50	120 QL	61	ND(1) Q	ND(0.010) QL
	10FWG20WG	9/10/2010	442.64	14.07	428.57	0.87	NA	NA	**6,700**	**3,700**	0.88 J	ND(1)	42	97	47	ND(1)	ND(0.010)
	11FW3G06WG	6/23/2011	442.64	13.38	429.26	2.37	21	2.5 J	**7,800**	**2,300**	0.79 J	0.9 J	30	76	31	ND(1)	ND(0.020)
	11FW3G13WG	10/5/2011	442.64	13.42	429.22	3.82	NA	NA	**12,000**	**2,200**	NA	NA	NA	NA	NA	NA	NA
	12FW3G08WG	10/4/2012	442.64	14.22	428.42	0.19	27	ND(0.5)	**9,400**	**3,200**	1.2 J	1.4 J	40	110	52	ND(1)	ND(1)
	13FW3G10WG	5/29/2013	442.64	11.11	431.53	0.23	17	1.7 J	**3,800**	1,900	ND(0.4) QL	0.59 J,QL	24 QL	90 QL	44 QL	ND(0.4) QL	ND(0.4) QL
	14FWOU383WG	10/23/2014	442.64	13.38	429.26	0.28	26.5	8.61	**7,500**	**2,800**	0.55	1.40	37	160	75	0.24 J	ND(0.2)
AP-10033 (GWP-2001A)	10FWG09WG	6/30/2010	448.49	20.55	427.94	1.02	NA	NA	**5,000**	1,600 QH	1.4	2.3	61	42 QL	35	ND(1) Q	0.0095 J,QL
	10FWG18WG	9/9/2010	448.49	19.99	428.50	1.56	NA	NA	**2,100**	**2,200 QL**	0.31 J	0.68 J	9.6	3.9	2.8	ND(1)	ND(0.010)
	11FW3G09WG	6/24/2011	448.49	18.82	429.67	4.1	6.4	11	**1,800**	**2,700**	1.4 J	45	120	28	17	ND(2)	0.0081 J
	11FW3G10WG[3]	6/24/2011	448.49	18.82	429.67	4.1	6.6	12	**1,700**	**3,200**	1.4 J	43	110	28	15	ND(2)	0.0066 J
	11FW3G19WG	10/6/2011	448.49	19.49	429.00	0.7	NA	NA	1,200	**5,200**	NA	NA	NA	NA	NA	NA	NA
	11FW3G20WG[3]	10/6/2011	448.49	19.49	429.00	0.7	NA	NA	1,000	**5,200**	NA	NA	NA	NA	NA	NA	NA
	12FW3G06WG	10/3/2012	448.49	20.15	428.34	0.17	15	1.5	1,300	**11,000**	ND(10)	45 J	490	100	60	ND(10)	ND(10)
	13FW3G01WG	5/23/2013	448.49	19.38	429.11	0.25	18	3.9 J	**1,500**	**9,800**	ND(1)	79 QH	490 QH	130 QH	190 QH	ND(1)	ND(1)
	14FWOU378WG	10/23/2014	448.49	19.34	429.15	0.79	20.9	9.57	940	**7,800**	1.5 J	14	460	110	55	ND(0.75)	ND(1)
AP-10028[1] (GWP-80)	10FWG10WG	6/30/2010	447.38	19.60	427.78	0.31	NA	NA	**9,000**	1,400 QH	**10**	0.73 J,B	2.1	2.8 QL	1.5	ND(1) Q	ND(0.010) QL
	10FWG13WG	9/8/2010	447.38	19.01	428.37	3.56	NA	NA	**3,300**	**2,800**	**8**	0.34 J	0.79 J	1.1	ND(1)	ND(1)	ND(0.010)
	11FW3G02WG	6/22/2011	447.38	18.33	429.05	1.54	11	38	**4,900**	1,400	**6.4**	0.33 J	6.2	4.1	1	ND(1)	ND(0.020)
	11FW3G15WG	10/6/2011	447.38	18.53	428.85	0.49	NA	NA	**4,200**	1,100	NA	NA	NA	NA	NA	NA	NA
	12FW3G09WG	10/4/2012	447.38	19.26	428.12	0.22	10	7.4	**2,400**	1,600 J,QH	4.2 J	ND(2)	1.3 J	2.5 J	1.9 J	ND(1)	ND(1)
	13FW3G02WG	5/23/2013	447.38	18.5	428.88	0.26	11	16	**3,000**	1,200	2.9	0.42 J	0.55 J	1.3 J	4.5	ND(0.4)	ND(0.4)
	14FWOU377WG	10/23/2014	447.38	18.45	428.93	0.55	6.78	130	**3,200**	960	4.6	0.29 J	3.8	2.3	0.49 J,B	ND(0.15)	ND(0.2)
AP-6008	10FWG05WG	6/30/2010	445.76	18.00	427.76	0.28	NA	NA	**1,800**	190	ND(1)	0.10 J,B	0.11 J, B	0.15 J,Q	ND(1)	ND(1) Q	ND(0.010) QL
	10FWG11WG	9/8/2010	445.76	17.42	428.34	0.55	NA	NA	230 Q	400	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(0.019)
	10FWG12WG[3]	9/8/2010	445.76	17.42	428.34	0.55	NA	NA	320	420	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(0.019)
	11FW3G08WG	6/23/2011	445.76	16.65	429.11	1.42	22	32	720	250	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(0.020)
	11FW3G14WG	10/6/2011	445.76	16.91	428.85	0.37	NA	NA	580	160	NA	NA	NA	NA	NA	NA	NA
	12FW3G07WG	10/3/2012	445.76	17.6	428.16	0.18	22	23 MH	670 J,ML	150 J,QH	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)
	13FW3G03WG	5/28/2013	445.76	14.75	431.01	0.17	20	18	860	190	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)
	14FWOU385WG	10/23/2014	445.76	16.81	428.95	0.32	15.5	25.4	**4,000**	130	ND(0.1)	0.12 J	ND(0.1)	0.14 J,B	ND(0.2)	ND(0.15)	ND(0.2)

Table 5-16 - Groundwater Sample Field-Screening and Analytical Results
Central Header, Former Building 1144, and Eight-Car Header

Probe/Well Number	Sample Number	Sample Date	Survey Elevation	Water Level (ft BTOC)	Water Elevation (ft msl)	Dissolved Oxygen (mg/L)	Iron II (mg/L)	Sulfate (mg/L)	DRO (µg/L)	GRO (µg/L)	ROD Contaminants of Concern (µg/L) Benzene	Toluene	Ethylbenzene	1,2,4-Trimethyl-benzene	1,3,5-Trimethyl-benzene	1,2-Dichloro-ethane	1,2-Dibromo-ethane[2]
CLEANUP LEVELS									**1,500**	**2,200**	**5**	**1,000**	**700**	**1,850**	**1,850**	**5**	**0.05**
CH-MP6	10FWG07WG	6/30/2010	446.31	18.47	427.84	1.09	NA	NA	1,200	860 QH	2.1	66	31	8.3 QL	3.8	ND(1) Q	ND(1) QL
	10FWG17WG	9/9/2010	446.31	17.88	428.43	0.67	NA	NA	230	870 QL	1.2	51	19	6.4	3	0.81 J	ND(0.010)
	11FW3G03WG	6/22/2011	446.31	17.1	429.21	2.44	0.93	34	640	710	3	91	23	6.2	2.8	ND(1)	0.0049 J
	11FW3G16WG	10/6/2011	446.31	17.35	428.96	0.68	NA	NA	350	1,500	NA	NA	NA	NA	NA	NA	NA
	12FW3G04WG	10/3/2012	446.31	18.05	428.26	0.19	2.9	27	390	1,800	0.98 J	65	38	19	9.3	ND(0.4)	ND(0.4)
	13FW3G05WG	5/28/2013	446.31	14.82	431.49	0.18	2.2	24	180 J	120	1.7	1.4	1.6	1.2	0.58 J	ND(0.2)	ND(0.2)
	14FWOU375WG	10/23/2014	446.31	17.27	429.04	0.59	5.57	70.9	740	**3,100**	1.7	270	200	41	15	ND(0.15)	ND(0.2)
CH-MP5	10FWG08WG	6/30/2010	446.45	18.87	427.58	8.11	NA	NA	1,100	22 J,B	ND(1)	0.17 J,B	0.15 J,B	0.11 J	ND(1)	ND(1) Q	ND(0.010) QL
	10FWG14WG	9/8/2010	446.45	18.13	428.32	5.04	NA	NA	190	21 J	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(0.010)
	11FW3G05WG	6/23/2011	446.45	17.46	428.99	1.1	2.1	37	550	97	**30**	0.31 J	ND(1)	ND(1)	ND(1)	ND(1)	ND(0.020)
	11FW3G21WG	10/6/2011	446.45	17.6	428.85	0.41	NA	NA	200 J	76	NA	NA	NA	NA	NA	NA	NA
	12FW3G03WG	10/3/2012	446.45	18.45	428.00	0.29	0.62	30	200 J	78 B	**28**	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)
	13FW3G04WG	5/28/2013	446.45	14.97	431.48	0.19	0.28	30	310	13 J	3.8	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)
	14FWOU374WG	10/23/2014	446.45	17.53	428.92	0.44	0.429	40.4	180	ND(25)	ND(0.1)	0.16 J	ND(0.1)	0.26 J,B	0.24 J,B	ND(0.15)	ND(0.2)
CH-MP9	10FWG06WG	6/30/2010	447.68	19.68	428.00	3.47	NA	NA	**2,200**	850 QH	0.22 J,B	0.47 J,B	96	7.7 QL	2.4	ND(1) Q	ND(0.010) QL
	10FWG19WG	9/10/2010	447.68	17.88	429.80	0.67	NA	NA	1,300	**4,200**	ND(1)	ND(1)	310	13	6.9 J	ND(1)	ND(0.010)
	11FW3G07WG	6/23/2011	447.68	18.33	429.35	0.81	4.6	18	680	1,900	0.34 J	0.83 J	140	16	7.9	ND(1)	ND(0.020)
	11FW3G22WG	10/6/2011	447.68	18.65	429.03	0.79	NA	NA	370	**2,700**	NA	NA	NA	NA	NA	NA	NA
	12FW3G05WG	10/3/2012	447.68	19.28	428.40	1.03	6.9	14	300	**5,000**	ND(4)	ND(8)	290	69	32	ND(4)	ND(4)
	13FW3G06WG	5/28/2013	447.68	16	431.68	1.84	1.8	40	**1,600**	430	ND(0.2)	0.27 J	21	2.7	1	ND(0.2)	ND(0.2)
	14FWOU376WG	10/23/2014	447.68	18.5	429.18	1.03	12.8	20	**20,000**	**5,100**	0.46 J	1.3	300	67	26	0.18 J	ND(0.4)
Former Building 1144																	
AP-10027[1] (1144-MP4)	10FWH06WG	6/29/2010	446.56	18.53	428.03	1.1	NA	NA	**25,000**	310	3.1	1.1 B,Q	1.1	7.7	4.4	ND(1)	ND(1)
	10FWH11WG[3]	6/29/2010	446.56	18.53	428.03	1.1	NA	NA	**24,000**	510	3.2	1.6 B	1.2	9.5	5.5	ND(1)	ND(1)
	10FWH21WG	9/13/2010	446.56	18.02	428.54	0.26	NA	NA	**8,700**	490	3.5	0.65 J	1.2	6.2	3.7	ND(1)	ND(2)
	11FW3H04WG	6/21/2011	446.56	17.24	429.32	5.31	12	1 J, Q	**11,000**	230	3.8	3.1	2.6	2.5	1.2	ND(1)	ND(1)
	11FW3H05WG[3]	6/21/2011	446.56	17.24	429.32	5.31	13	0.48 J	**11,000**	210	3.7	2.8	2.3	2.3	1.1	ND(1)	ND(1)
	11FW3H17WG	10/4/2011	446.56	17.48	429.08	0.41	NA	NA	**8,900**	240	NA	NA	NA	NA	NA	NA	NA
	11FW3H18WG[3]	10/4/2011	446.56	17.48	429.08	0.41	NA	NA	**8,000**	230	NA	NA	NA	NA	NA	NA	NA
	12FW3H01WG	10/4/2012	446.56	18.36	428.20	0.86	19	0.23 J,Q	**9,700**	330	2.1 J	ND(1.6)	3.1 J	4.3	2.1 J	ND(0.8)	ND(0.8)
	12FW3H02WG[3]	10/4/2012	446.56	18.36	428.20	0.86	20	ND(0.5)Q	**9,200**	370	2.1 J	ND(1.6)	3.2 J	4.5	2.2 J	ND(0.8)	ND(0.8)
	13FW3H04WG	5/22/2013	446.56	18.86	427.70	0.21	20	ND(0.5)	**19,000**	350	4.7	4	6.5	3.6	1.2	ND(0.2)	ND(0.2)
	13FW3H05WG[3]	5/22/2013	446.56	18.86	427.70	0.21	24	ND(0.5)	**20,000**	330	4.8	4.1	6.7	3.6	1.3	ND(0.2)	ND(0.2)
	SAMPLE WAS NOT COLLECTED AS THE WELL WAS FOUND TO BE BROKEN																
GWP-148	10FWH08WG	6/29/2010	445.45	17.90	427.55	0.39	NA	NA	**8,400**	650 QH	0.70 J	0.53 J, B	3.4	48	47	ND(1)	ND(1)
	10FWH13WG	9/8/2010	445.45	17.44	428.01	0.2	NA	NA	**2,600**	1,300	0.74 J	0.54 J	3	46	52	ND(1)	ND(1)
	11FW3H10WG	6/22/2011	445.45	17.24	428.21	5.31	16	1.1 J	**3,000**	470	0.58 J	0.52 J	1.9	26	34	ND(1)	ND(1)
	11FW3H19WG	10/4/2011	445.45	16.86	428.59	0.39	NA	NA	**4,800**	500	NA	NA	NA	NA	NA	NA	NA
	12FW3H09WG	10/4/2012	445.45	17.7	427.75	0.17	28	ND(0.5)	**4,700**	820	ND(0.8)	ND(1.6)	1.7 J	27	33	ND(0.8)	ND(0.8)
	13FW3H09WG	5/22/2013	445.45	17.17	428.28	0.53	21	1.2 J	**3,400**	580	ND(0.2)	0.38	2.3	32	39	ND(0.2)	ND(0.2)
	14FWOU386WG	10/23/2014	445.45	16.89	428.56	0.37	28.2	0.24	**6,000**	760	0.59	0.53	3.1	60	58	0.10 J	ND(0.2)
AP-10032[1] (GWP-147)	10FWH09WG	6/29/2010	446.7	18.70	428.00	0.21	5.95	66.8	**21,000**	370	0.92 J	0.21 J,B	14	32	12	ND(1)	ND(1)
	10FWH20WG	9/10/2010	446.7	18.27	428.43	0.57	NA	NA	**4,300**	200	0.26 J	ND(0.25)	1.2	3.5	1.7	ND(1)	ND(1)
	11FW3H02WG	6/21/2011	446.7	17.47	429.23	5.2	3.6	29	**5,100**	68	ND(1)	ND(1)	2.4	2.3	0.35 J	ND(1)	ND(1)
	11FW3H12WG	10/3/2011	446.7	17.67	429.03	0.5	NA	NA	**6,400**	92 B	NA	NA	NA	NA	NA	NA	NA
	12FW3H11WG	10/8/2012	446.7	18.62	428.08	0.24	6.3	16	**4,400**	110 B	0.24 J	ND(0.4)	1.5	4.1	2	ND(0.2)	ND(0.2)
	SAMPLE WAS NOT COLLECTED AS THE WELL WAS FOUND TO BE BROKEN																
GWP-149	10FWH05WG	6/29/2010	445.61	17.67	427.94	1.08	NA	NA	**25,000**	100 B	0.36 J	0.14 J,B	0.18 J,B	0.35 J	0.17 J,B	ND(1)	ND(1)
	10FWH11WG	9/8/2010	445.61	17.12	428.49	0.41	NA	NA	**5,100 QH**	120	ND(1)	ND(1)	0.21 J	0.32 J	ND(1)	ND(1)	ND(1)
	11FW3H08WG	6/22/2011	445.61	16.40	429.21	2.13	2.7	9.6	**7,100**	85	ND(1)	ND(1)	ND(1)	0.23 J	ND(1)	ND(1)	ND(1)
	11FW3H21WG	10/4/2011	445.61	16.60	429.01	0.23	NM	NM	**6,300**	61 B	NA	NA	NA	NA	NA	NA	NA
	12GW3H07WG	10/4/2012	445.61	17.35	428.26	0.24	4.9	8.6	**9,100**	75 B	ND(0.8)	ND(1.6)	ND(0.8)	ND(0.8)	ND(1.6)	ND(0.8)	ND(0.8)
	13FW3H10WG	5/23/2013	445.61	16.71	428.90	0.19	6.2	6.9	**7,700**	91	0.36 J	ND(0.4)	ND(0.2)	0.18 J	ND(0.4)	ND(0.2)	ND(0.2)
	14FWOU382WG	10/23/2014	445.61	16.48	429.13	0.23	10	3.01	**11,000**	240	0.66	0.22 J	703	7.7	4.8	ND(0.15)	ND(0.2)

Table 5-16 - Groundwater Sample Field-Screening and Analytical Results
Central Header, Former Building 1144, and Eight-Car Header

Probe/Well Number	Sample Number	Sample Date	Survey Elevation	Water Level (ft BTOC)	Water Elevation (ft msl)	Dissolved Oxygen (mg/L)	Iron II (mg/L)	Sulfate (mg/L)	DRO (µg/L)	GRO (µg/L)	ROD Contaminants of Concern (µg/L)						
											Benzene	Toluene	Ethylbenzene	1,2,4-Trimethyl-benzene	1,3,5-Trimethyl-benzene	1,2-Dichloro-ethane	1,2-Dibromo-ethane[2]
CLEANUP LEVELS									**1,500**	**2,200**	**5**	**1,000**	**700**	**1,850**	**1,850**	**5**	**0.05**
GWP-131	10FWH07WG	6/29/2010	446.54	18.35	428.19	0.28	NA	NA	1,100	420 QH	ND(1)	0.25 J,B	1.3	20	13	ND(1)	ND(1)
	10FWH12WG	9/8/2010	446.54	17.9	428.64	0.21	NA	NA	500	1,100	ND(1)	ND(1)	1.6 J	22	14	ND(1)	ND(1)
	11FW3H11WG	6/22/2011	446.54	17.13	429.41	2.66	14	37	540	640	ND(1)	0.21 J	1.4	15	12	ND(1)	ND(1)
	11FW3H20WG	10/4/2011	446.54	17.33	429.21	0.19	NM	NM	970	550	NA	NA	NA	NA	NA	NA	NA
	12FW3H08WG	10/4/2012	446.54	18.1	428.44	0.21	14	5.7	510	730	ND(0.2)	0.29 J	0.95 J	14	13	ND(0.2)	ND(0.2)
	13FW3H07WG	5/22/2013	446.54	17.52	429.02	0.23	13	14	460	460	ND(0.2)	0.21 J	0.45 J	5.8	5.6	ND(0.2)	ND(0.2)
	14FWOU384WG	10/23/2014	446.54	17.18	429.36	0.24	36.2	53	1,100	490	0.18 J	0.22 J	1.2	11	3.2	ND(0.15)	ND(0.2)
1144-MP7	10FWH03WG	6/29/2010	446.18	18.19	427.99	1.08	NA	NA	**19,000 QH**	140	0.59 J	0.30 J,B	0.15 J,B	0.40 J	2.6	ND(1)	ND(1)
	10FWH14WG	9/8/2010	446.18	17.7	428.48	0.23	NA	NA	**6,000**	260	0.5 J	0.49 J	0.17 J	0.41 J	6.1	ND(1)	ND(1)
	11FW3H01WG	6/21/2011	446.18	16.89	429.29	1.03	9.1	14	**7,000**	110	ND(1)	0.42 J	ND(1)	0.32 J	2.6	ND(1)	ND(1)
	11FW3H15WG	10/3/2011	446.18	17.1	429.08	0.65	NM	NM	**15,000**	180 QH	NA	NA	NA	NA	NA	NA	NA
	12FW3H04WG	10/4/2012	446.18	18	428.18	1.03	27	6.8	**13,000**	150	ND(0.8)	ND(1.6)	ND(0.8)	ND(0.8)	3.7 J	ND(0.8)	ND(0.8)
	13FW3H02WG	5/22/2013	446.18	17.41	428.77	0.46	14	11	**4,600**	93	0.17 J	0.18 J	ND(0.2)	0.45 J	3.9	ND(0.2)	ND(0.2)
	14FWOU389WG	10/23/2014	446.18	17.1	429.08	0.38	37.9	7.78	**26,000 J+**	210	1.1	0.76	0.41 J	1.5 J	7.9	ND(0.15)	ND(0.2)
1144-MP8	10FWH04WG	6/29/2010	445.72	17.68	428.04	1.53	39	3.6	**69,000**	360	4.4	2.5	0.59 J	16	30	ND(1)	ND(1)
	10FWH16WG	9/9/2010	445.72	17.23	428.49	0.17	NA	NA	**12,000 Q**	640	4.8	3	0.86 J	17	31	ND(1)	ND(2)
	10FWH17WG[3]	9/9/2010	445.72	17.23	428.49	0.17	NA	NA	**37,000**	660	4.8	2.9	0.89 J	17	30	ND(1)	ND(2)
	11FW3H03WG	6/21/2011	445.72	16.37	429.35	0.95	33	0.71 J	**23,000**	340	4.5	2.2	1	18	31	ND(1)	ND(1)
	11FW3H22WG	10/5/2011	445.72	16.55	429.17	2.45	NM	NM	**37,000**	170	NA	NA	NA	NA	NA	NA	NA
	12FW3H03WG	10/4/2012	445.72	17.44	428.28	1.31	59	ND(0.5)	**54,000**	620	3.5 J	ND(2)	ND(2)	23	36	ND(2)	ND(2)
	13FW3H07WG	5/22/2013	445.72	16.87	428.85	0.27	36	ND(0.5)	**16,000**	470	4.4	1.4	1.9	36	49	ND(0.2)	ND(0.2)
	14FWOU379WG	10/23/2014	445.72	16.5	429.22	0.45	85.7	0.35	**78,000 J+**	330	**5.1**	1.6	3	49 J	63 J	ND(0.15)	ND(0.2)
	14FWOU380WG[3]	10/23/2014	445.72	16.5	429.22	0.45	84.8	0.34	**78,000 J+**	330	**5.1**	1.6	2.7	46	60	ND(0.15)	ND(0.2)
1144-MP9	10FWH02WG	6/29/2010	446.82	18.89	427.93	1.27	NA	NA	**72,000 QH**	740 QH	0.80 J	0.22 J,B	0.99 J	12	3.2	ND(1)	ND(1)
	10FWH19WG	9/10/2010	446.82	18.43	428.39	3.42	NA	NA	**34,000**	2,000	0.78 J	ND(1)	0.71 J	7.1	2.3	ND(1)	ND(1)
	11FW3H07WG	6/21/2011	446.82	17.59	429.23	0.71	30	1.8 J	**28,000 QH**	470 QH	0.71 J	0.49 J	0.33 J	2.2	1.2	ND(1)	ND(1)
	11FW3H16WG	10/4/2011	446.82	17.92	428.90	0.87	NM	NM	**38,000**	530 QH	NA	NA	NA	NA	NA	NA	NA
	12FW3H05WG	10/4/2012	446.82	18.68	428.14	1.12	38	0.75 J	**21,000**	760	ND(0.8)	ND(1.6)	ND(0.8)	4.9	1.6 J	ND(0.8)	ND(0.8)
	13FW3H01WG	5/22/2013	446.82	18.14	428.68	1.03	34	ND(0.5)	**19,000**	470	0.45 J, QH	0.21 J,QH	0.37 J,QH	6.6 QH	2.7 QH	ND(0.2)	ND(0.2)
	14FWOU388WG	10/23/2014	446.82	17.73	429.09	1.4	51.3	54.4	**140,000**	1000	0.37 J	1.1	0.30 J	4.1	1.7 J	ND(0.15)	ND(0.2)
1144-MP10	10FWH01WG	6/29/2010	446.25	18.51	427.74	1.01	NA	NA	**12,000 QH**	260	1.8	0.24 J,B	0.36 J, B	2.4	0.35 J,B	ND(1)	ND(1)
	10FWH18WG	9/9/2010	446.25	18	428.25	0.29	NA	NA	**3,800**	420	1	ND(1)	0.31 J	2.1	0.27 J	ND(1)	ND(1)
	11FW3H09WG	6/21/2011	446.25	17.21	429.04	0.98	9.8	11	**4,500**	130	0.44 J	0.46 J	ND(1)	0.74 J	0.87 J	ND(1)	ND(1)
	11FW3H13WG	10/3/2011	446.25	17.41	428.84	0.57	NA	NA	**6,600**	180	NA	NA	NA	NA	NA	NA	NA
	12FW3H06WG	10/4/2012	446.25	18.45	427.80	0.52	17	4.1 J	**5,400**	270	ND(0.8)	ND(1.6)	ND(0.8)	1.3 J	1.1 J	ND(0.8)	ND(0.8)
	13FW3H03WG	5/22/2013	446.25	17.95	428.30	1.28	15	5.4	**5,400**	210	0.78 J	ND(0.4)	ND(0.2)	1.1	0.25 J	ND(0.2)	ND(0.2)
	14FWOU387WG	10/23/2014	446.25	17.61	428.64	0.77	30.9	5.77	**21,000**	400	2.9	0.5	1.1	11	2.9	ND(0.15)	ND(0.2)
GWP-2003E	10FWH10WG	6/29/2010	446.74	18.25	428.49	0.53	NA	NA	**28,000**	510	1.8	0.28 J,B	8.9	20	12	ND(1)	ND(1)
	10FWH15WG	9/9/2010	446.74	17.8	428.94	0.21	17.4	23.4	**14,000**	1,200	1.4	0.34 J	7.1	27	20	ND(1)	ND(1)
	11FW3H06WG	6/21/2011	446.74	16.96	429.78	8.53	15	22	**30,000**	520 QH	0.41 J	0.18 J	3.5	11	17	ND(1)	ND(1)
	11FW3H14WG	10/3/2011	446.74	17.12	429.62	0.6	NA	NA	**50,000**	550 QH	NA	NA	NA	NA	NA	NA	NA
	12FW3H10WG	10/4/2012	446.74	18	428.74	0.16	22	20	**7,700**	1,000	0.69 J	0.17 J	6.1	32	37	ND(0.2)	ND(0.2)
	13FW3H08WG	5/22/2013	446.74	17.5	429.24	0.26	12	27	**53,000 J**	590	0.17 J	ND(0.4)	1.2	4.1	4.2	ND(0.2)	ND(0.2)
	14FWOU381WG	10/23/2014	446.74	17.06	429.68	0.51	7.65	175	**35,000**	320	0.75	0.49 J	4.3	13	9.4	ND(0.15)	ND(0.2)
Eight Car Header																	
GWP-110	10FWI08WG	6/29/2010	445.26	17.00	428.26	0.38	NA	NA	**35,000 QH**	2,200 QH	2.2	53	52	93	60	ND(1)	ND(1)
	11FW3I01WG	6/20/2011	445.26	16.55	428.71	3.38	25	8.4	**19,000**	1,300	1 J	60	21	65	57	ND(4)	ND(4)
	11FW3I15WG	10/3/2011	445.26	15.90	429.36	0.95	NA	NA	**17,000**	1,500	NA	NA	NA	NA	NA	NA	NA
	12FW3I02WG	10/8/2012	445.26	16.73	428.53	0.23	36	2.2 J	**12,000**	**2,700**	1.6 QH	82 QH	52 QH	100 QH	70 QH	ND(0.2)	ND(0.2)
	12FW3I03WG[3]	10/8/2012	445.26	16.73	428.53	0.23	36	2.3 J	**13,000**	**3,200**	1.7 QH	82 QH	51 QH	100 QH	71 QH	ND(0.2)	ND(0.2)
	MONITORING WELL WAS REMOVED FROM THE MONITORING NETWORK BASED ON LTMO ANALYSIS																
GWP-2003B	10FWI07WG	6/29/2010	445.45	17.10	428.35	1.82	NA	NA	**72,000 QH**	2,200 QH	0.35 J,B	1.8 J,B	42	150	85	ND(1)	ND(1)
	11FW3I02WG	6/20/2011	445.45	15.69	429.76	3.06	94	0.65 J	**130,000**	1,900 QH	ND(20)	ND(20)	11 J	47	150	ND(20)	ND(20)
	11FW3I14WG	10/3/2011	445.45	16.04	429.41	0.82	NA	NA	**150,000**	1,900	NA	NA	NA	NA	NA	NA	NA
	12FW3I04WG	10/8/2012	445.45	17.86	427.59	1.32	91	ND(0.5)	**73,000 J**	**4,700**	ND(2)	3.8 J	61	200	140	ND(2)	ND(2)
	13FW3I02WG	5/21/2013	445.45	16.44	429.01	0.2	94	0.94 J	**200,000 J**	**2,200**	ND(2) QL	ND(4) QL	7.4 J,QL	32 QL	120 QL	ND(2) QL	ND(2) QL
	14FWOU3101WG	10/24/2014	445.45	16.02	429.43	1.14	106 J-	79.6	**120,000**	2,100	0.5	4.2	13	97	110	ND(0.33)	ND(0.2)

Table 5-16 - Groundwater Sample Field-Screening and Analytical Results
Central Header, Former Building 1144, and Eight-Car Header

Probe/Well Number	Sample Number	Sample Date	Survey Elevation	Water Level (ft BTOC)	Water Elevation (ft msl)	Dissolved Oxygen (mg/L)	Iron II (mg/L)	Sulfate (mg/L)	DRO (µg/L)	GRO (µg/L)	ROD Contaminants of Concern (µg/L)						
											Benzene	Toluene	Ethylbenzene	1,2,4-Trimethyl-benzene	1,3,5-Trimethyl-benzene	1,2-Dichloro-ethane	1,2-Dibromo-ethane[2]
CLEANUP LEVELS									**1,500**	**2,200**	**5**	**1,000**	**700**	**1,850**	**1,850**	**5**	**0.05**
GWP-130	10FWI06WG	6/28/2010	445.26	17.02	428.24	0.4	NA	NA	**22,000**	920 QH	0.52 J,B	0.19 J,B	22	97	76	ND(1)	ND(1)
	11FW3I03WG	6/20/2011	445.26	15.69	429.57	4.64	21	24	**18,000 QH**	1,800	0.91 J	ND(4)	44	200	240	ND(4)	ND(4)
	11FW3I13WG	10/3/2011	445.26	15.98	429.28	0.42	NA	NA	**25,000**	**2,300**	NA	NA	NA	NA	NA	NA	NA
	12FW3I01WG	10/8/2012	445.26	16.83	428.43	0.49	30	10	**9,900**	**2,700**	0.52 J	0.21 J	38	130	110	ND(0.2)	ND(0.2)
	13FW3I01WG	5/21/2013	445.26	16.42	428.84	0.23	27	16	**17,000**	**3,600**	ND(2)	ND(4)	50	210	180	ND(2)	ND(2)
	14FWOU3100WG	10/24/2014	445.26	15.93	429.33	0.94	45.1 J-	57.5	**29,000**	**3,200**	0.64	0.64	63	290	200	ND(0.46)	MD(4)
AP-6006	10FWI03WG	6/28/2010	444.95	16.85	428.10	0.23	16	1.4	**13,000 J**	280	2.4	0.33 J,B	7.6	11	5.8	ND(1)	ND(1)
	11FW3I05WG	6/20/2011	444.95	15.50	429.45	0.64	16	3.6 J	**5,200**	180	1.4	ND(1)	2.5	1.3	0.45 J	ND(1)	ND(1)
	11FW3I10WG	10/3/2011	444.95	15.80	429.15	0.3	NA	NA	**5,300**	140	NA	NA	NA	NA	NA	NA	NA
	12FW3I06WG	10/8/2012	444.95	16.67	428.28	0.24	37	ND(0.5)	**6,100**	460	1.7	0.38 J	6.2	12	7.5	ND(0.2)	ND(0.2)
	13FW3I07WG	5/22/2013	444.95	16.15	428.80	0.2	44	ND(0.5)	**8,400**	430	1.9	0.25 J	11	13	2.9	ND(0.2)	ND(0.2)
	14FWOU3106WG	10/24/2014	444.95	15.92	429.03	0.47	19.4	ND(0.2) J	**6,300**	180	1.3	0.43 J	2.4	15	8.6	ND(0.15)	ND(0.2)
AP-10030[1] (GWP-57)	10FWI04WG	6/28/2010	446.39	18.40	427.99	0.23	NA	NA	**4,200**	79 B	1.6	0.16 J,B	0.27 J,B	0.72 J	1.6	ND(1)	ND(1)
	11FW3I06WG	6/20/2011	446.39	17.05	429.34	3.33	9.2	19	980	52	0.29 J	ND(1)	ND(1)	0.19 J	ND(1)	ND(1)	ND(1)
	11FW3I07WG[3]	6/20/2011	446.39	17.05	429.34	3.33	9.2	19	910	49	0.30 J	ND(1)	ND(1)	0.17 J	3.7	ND(1)	ND(1)
	11FW3I11WG	10/3/2011	446.39	17.34	429.05	0.59	NA	NA	1,400	79 B,Q	NA	NA	NA	NA	NA	NA	NA
	11FW3I12WG[3]	10/3/2011	446.39	17.34	429.05	0.59	NA	NA	**1,600**	55 B	NA	NA	NA	NA	NA	NA	NA
	12FW3I08WG	10/9/2012	446.39	18.17	428.22	0.36	0.61	26	800 J,ML	18 J,B	1.4	ND(0.4)	ND(0.2)	ND(0.2)	0.38 J	ND(0.2)	ND(0.2)
	13FW3I05WG	5/21/2013	446.39	17.68	428.71	0.16	11	18	970	41	0.36 J	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.2)	ND(0.2)
	14FWOU3105WG	10/24/2014	446.39	17.44	428.95	1.7	3.5	24.5	610 J	23 J	0.25 J	0.06 J	0.55 J	0.92 J	0.91 J	ND(0.15)	ND(0.2)
AP-7538	10FWI05WG	6/28/2010	445.68	17.60	428.08	0.43	NA	NA	**16,000**	170	0.67 J,B	0.75 J,B	2	11	7	ND(1)	ND(1)
	11FW3I08WG	6/21/2011	445.68	16.35	429.33	6.77	31	14	**6,700**	140 ML	0.6 J	ND(1)	ND(1)	8.7	3.7	ND(1)	ND(1)
	11FW3I09WG	10/3/2011	445.68	16.56	429.12	0.67	NA	NA	**18,000**	110	NA	NA	NA	NA	NA	NA	NA
	12FW3I07WG	10/9/2012	445.68	17.37	428.31	0.26	62	1.1 J	**18,000**	360	1.3	0.30 J	4.6	9.7	7.3	ND(0.2)	ND(0.2)
	13FW3I03WG	5/21/2013	445.68	16.90	428.78	0.16	35	8.5	**5,200**	170	2.8	ND(0.8) Q	0.98 J	3.3	1.7 J	ND(0.4) Q	ND(0.4) Q
	13FW3I04WG[3]	5/21/2013	445.68	16.90	428.78	0.16	36	8.6	**4,800**	170	2.8	ND(0.4) Q	0.98 J	3.2	1.6	ND(0.4) Q	ND(0.4) Q
	14FWOU3103WG	10/24/2014	445.68	16.70	428.98	1.29	21.4	156	**16,000**	150	0.55	0.25 J	2.8	20	10	ND(0.15)	ND(0.2)
	14FWOU3104WG[3]	10/24/2014	445.68	16.70	428.98	1.29	22.3	157	**15,000**	160	0.56	0.22 J	3.2	22	11	ND(0.15)	ND(0.2)
AP-10029[1] (GWP-53)	10FWI01WG	6/28/2010	447.05	18.80	428.25	0.19	NA	NA	**44,000**	390	1.1	0.53 J, B	1.3	10	6.7	ND(1)	ND(1)
	10FWI02WG[3]	6/28/2010	447.05	18.80	428.25	0.19	NA	NA	**42,000**	390	1.1	0.52 J, B	1.4	10	6.9	ND(1)	ND(1)
	11FW34I04WG	6/20/2011	447.05	17.55	429.50	0.87	39	1.4 J	**23,000**	330	1.0	0.19 J	1	3.5	2.6	ND(1)	ND(1)
	11FW3I16WG	10/3/2011	447.05	17.74	429.31	0.46	NA	NA	**23,000**	220	NA	NA	NA	NA	NA	NA	NA
	12FW3I05WG	10/8/2012	447.05	18.62	428.43	0.32	35	20	**15,000**	430	0.97 J	0.21 J	0.95 J	4.0	4.4	ND(0.2)	ND(0.2)
	13FW3I06WG	5/22/2013	447.05	18.20	428.85	0.27	30	0.94 J	**14,000**	350	1.2	0.33 J	1.5	1.9	0.26 J	ND(0.2)	ND(0.2)
	14FWOU3102WG	10/24/2014	447.05	17.78	429.27	0.4	7.31 J-	71.7	**17,000**	140	0.38 J	0.20 J	0.8	4.6	3.5	ND(0.15)	ND(0.2)

Bold results represent concentrations in excess of ROD remedial action goals

[1] Replacement wells installed in August 2009. Wells that were replaced are shown in parentheses.

[2] 1,2-Dibromoethane results were generated from either Method 8260 or Method 504.1. Results from Method 504.1 were used when available.

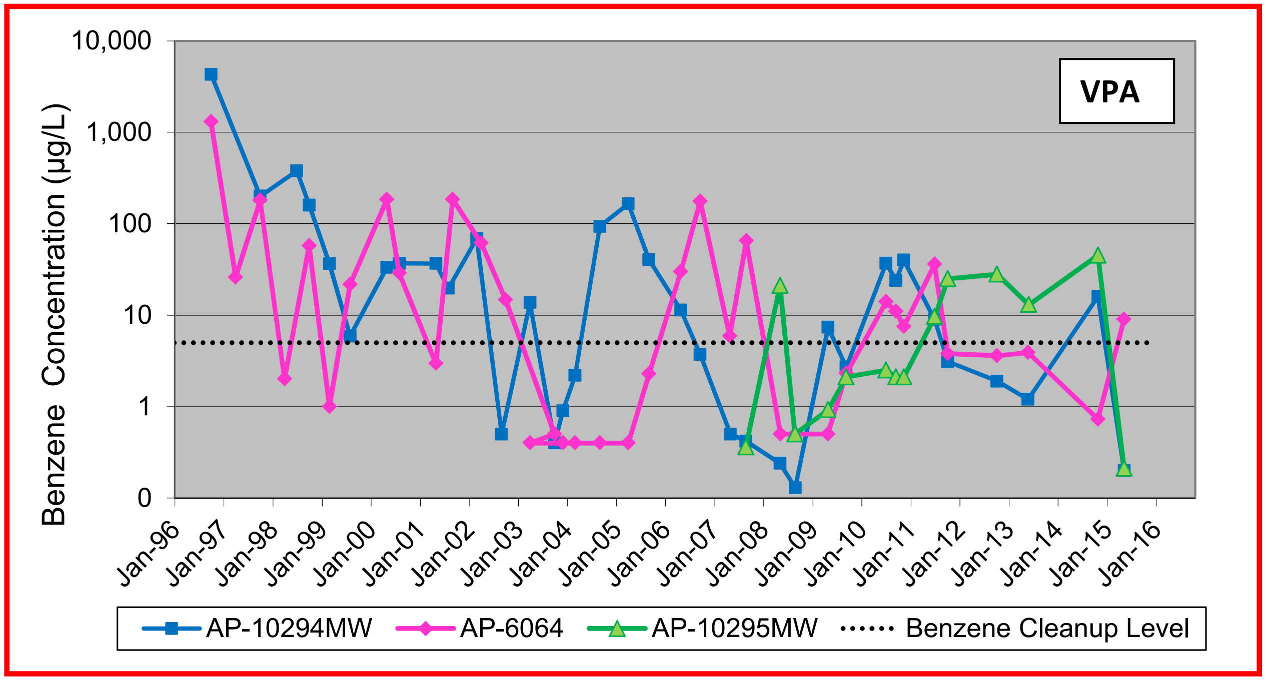
[3] Denotes sample is a field duplicate of preceding row

DRO - diesel range organics
GRO - gasoline range organics
LOD - limit of detection
LOQ - limit of quantitation
µg/L - micrograms per liter
ft BTOC - feet below top of casing

mg/L - milligram per liter
msl - mean seal level
NA - not analyzed
NM - not measured
ROD - Record of Decision

Data Qualifiers
B - analyte was detected in blank sample at similar concentration
J - result is estimated because it is less than the LOQ or due to a QC failure
J- or J+ - result is estimated with a high (+) or low (-) bias due to a QC failure (data starting in 2014)
ML or MH - result is estimated with a high (H) or low (L) bias due to matrix interference (data prior to 2014)
ND - detection limit (LOQ in parenthesis for data prior to 2012; LOD in parentheses for data starting in 2012)
QL or QH - result is estimated and biased high (H) or low (L) due to quality control failure (data prior to 2014)

Graph 3-1 – Benzene Concentrations in Valve Pit A Wells



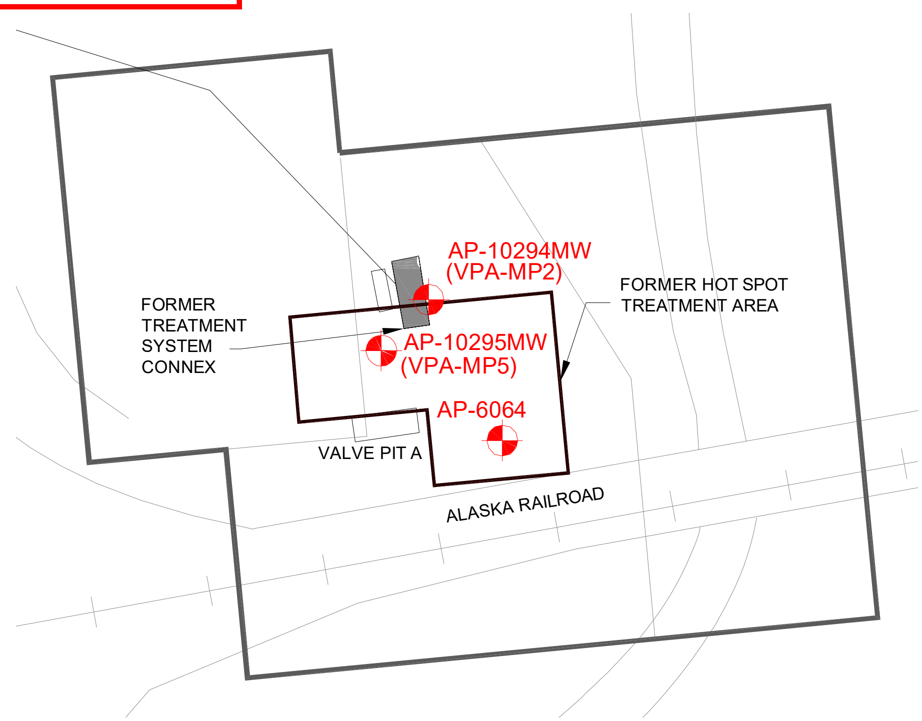


Table 3-3 - Summary of Mann-Kendall Trend Analysis of Central ROLF Wells[1]

Well	ROLF Site	DRO				GRO				Benzene			
		2011	2012	2013	2014	2011	2012	2013	2014	2011	2012	2013	2014
1144-MP7	Former Building 1144	Stable	Stable	Stable	Stable	-	-	-	-	-	-	-	
1144-MP8[2]		Stable	**No Trend**	**Stable**	**No Trend**	-	-	-	-	-	-	-	**Increasing**
1144-MP9		Stable	**Potentially Decreasing**	**Decreasing**	**Stable**	-	-	-	-	-	-	-	-
1144-MP10		Stable	**No Trend**	No Trend	No Trend	-	-	-	-	-	-	-	-
GWP-131		-	-	-	-	-	-	-	-	-	-	-	-
GWP-148		Stable	Stable	Stable	Stable	-		-	-	-		-	-
GWP-149		Stable	Stable	Stable	**No Trend**	-	-	-	-	-	-	-	-
GWP-2003E		Increasing	**No Trend**	**Potentially Increasing**	Potentially Increasing	-		-	-	-		-	-
AP-10027[6]		No Trend	No Trend	No Trend	BROKEN - NOT SAMPLED	-	-	-	BROKEN - NOT SAMPLED	-	-	-	BROKEN - NOT SAMPLED
AP-10032[3]		Stable	Stable	BROKEN - NOT SAMPLED	BROKEN - NOT SAMPLED	-	-	BROKEN - NOT SAMPLED	BROKEN - NOT SAMPLED	-	-	BROKEN - NOT SAMPLED	BROKEN - NOT SAMPLED
CH-MP2	Central Header	Stable	**Potentially Decreasing**	**Decreasing**	Decreasing	Stable	**No Trend**	No Trend	**Stable**	-	-	-	-
CH-MP5[4]		-	-	-	-	-	-	-	-	No Trend	No Trend	**Potentially Increasing**	**No Trend**
CH-MP6[5]		-	-	-	-	-	-	-	**Potentially Increasing**	-	-	-	-
CH-MP9		Stable	**Potentially Decreasing**	**Stable**	**No Trend**	No Trend	**Increasing**	**No Trend**	**Potentially Increasing**	-	-	-	-
GWP-2001C		No Trend	No Trend	**Stable**	Stable	No Trend	No Trend	**Stable**	**No Trend**	-	-	-	-
AP-6008		Stable	**No Trend**	No Trend	**Potentially Increasing**	-	-	-	-	-	-	-	-
AP-10028		Stable	**Potentially Decreasing**	**Decreasing**	Decreasing	Stable	Stable	Stable	**Decreasing**	Decreasing	Decreasing	Decreasing	Decreasing
AP-10031		-	-	-	-	Potentially Decreasing	Potentially Decreasing	**Stable**	**Decreasing**	-	-	-	-
AP-10033		Stable	Stable	**Potentially Decreasing**	**Decreasing**	Increasing	Increasing	Increasing	Increasing	-	-	-	-
GWP-130	Eight Car Header	No Trend	No Trend	No Trend	No Trend	Increasing	Increasing	Increasing	Increasing	-	-	-	-
GWP-2003B		Increasing	**No Trend**	**Increasing**	**Potentially Increasing**	No Trend	No Trend	No Trend	No Trend	-	-	-	-
AP-10029		No Trend	**Stable**	Stable	Stable	-	-	-	-	-	-	-	-
AP-10030		Stable	Stable	Stable	**Potentially Decreasing**	-	-	-	-	-	-	-	-
AP-6006		No Trend	No Trend	No Trend	No Trend	-	-	-	-	-	-	-	-
AP-7538		Stable	Stable	Stable	Stable	-	-	-	-	-	-	-	-

[1] Only wells having concentrations exceeding the cleanup level during the period of analysis are shown

[2] Benzene exceeded the cleanup level in 1144-MP8 for the first time in 2014

[3] AP-10032 was found to be broken in spring 2013 and a sample was not collected from this well

[4] Benzene concentrations increased from non-detect to above cleanup levels in CH-MP5 starting in 2011

[5] GRO concentration increased above the cleanup level in CH-MP6 for the first time in 2014

- Analyte did not exceed the cleanup level during the analysis period

[6] AP-10027 was found to be broken in 2014 and a sample was not collected from this well

2012 trend change shown in orange

2013 trend changes shown in green

2014 trend changes shown in blue

MAROS Statistical Trend Analysis Summary

Project: ROLF 2014 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

Time Period: 4/23/2009 **to** 10/24/2014

Consolidation Period: No Time Consolidation

Consolidation Type: Average

Duplicate Consolidation: Average

ND Values: Detection Limit

J Flag Values : Detection Limit

Well	Source/ Tail	Number of Samples	Number of Detects	Average Conc. (mg/L)	Median Conc. (mg/L)	All Samples "ND" ?	Mann-Kendall Trend	Linear Regression Trend
PHC as DIESEL FUEL								
1144-MP10	T	8	8	8.0E+00	5.4E+00	No	NT	NT
1144-MP7	T	8	8	1.3E+01	1.4E+01	No	S	NT
1144-MP8	T	8	8	4.1E+01	3.9E+01	No	NT	NT
1144-MP9	T	8	8	5.0E+01	3.6E+01	No	S	NT
AP-10028	T	9	9	5.0E+00	3.7E+00	No	D	D
AP-10029	S	8	8	2.1E+01	2.0E+01	No	S	NT
AP-10030	T	8	8	1.4E+00	9.8E-01	No	PD	D
AP-10031	T	9	9	2.2E-01	1.7E-01	No	D	D
AP-10033	T	9	9	2.2E+00	1.8E+00	No	D	D
AP-6006	T	7	7	6.5E+00	6.1E+00	No	NT	NT
AP-6008	T	8	8	1.2E+00	7.0E-01	No	PI	PI
AP-7538	T	8	8	1.5E+01	1.6E+01	No	S	S
CH-MP2	T	8	8	5.0E+00	4.2E+00	No	D	PD
CH-MP5	T	8	8	3.8E-01	2.5E-01	No	S	S
CH-MP6	T	8	8	4.8E-01	3.7E-01	No	PD	PD
CH-MP9	T	8	8	3.3E+00	9.9E-01	No	NT	PI
GWP-130	S	7	7	1.8E+01	1.8E+01	No	NT	PI
GWP-131	T	8	8	7.3E-01	6.1E-01	No	S	NT
GWP-148	T	8	8	4.9E+00	4.8E+00	No	S	S
GWP-149	T	9	9	9.9E+00	7.7E+00	No	NT	D
GWP-2001C	T	8	8	8.4E+00	7.7E+00	No	S	S
GWP-2003B	S	8	8	1.0E+02	9.7E+01	No	PI	I
GWP-2003E	S	8	8	2.8E+01	2.9E+01	No	PI	PI
PHC as GASOLINE								
1144-MP10	T	8	8	2.5E-01	2.4E-01	No	NT	NT
1144-MP7	T	8	8	1.6E-01	1.5E-01	No	NT	D
1144-MP8	T	8	8	4.2E-01	3.9E-01	No	S	S
1144-MP9	T	8	8	9.8E-01	7.5E-01	No	S	S
AP-10028	T	8	8	1.5E+00	1.4E+00	No	D	D
AP-10029	S	7	7	3.7E-01	3.5E-01	No	PD	D
AP-10030	T	7	7	1.1E-01	5.2E-02	No	PD	D
AP-10031	T	9	9	1.9E+00	1.6E+00	No	D	D
AP-10033	T	8	8	5.1E+00	4.0E+00	No	I	I
AP-6006	T	7	7	2.9E-01	2.8E-01	No	S	S

MAROS Statistical Trend Analysis Summary

Well	Source/ Tail	Number of Samples	Number of Detects	Average Conc. (mg/L)	Median Conc. (mg/L)	All Samples "ND" ?	Mann-Kendall Trend	Linear Regression Trend
PHC as GASOLINE								
AP-6008	T	8	8	2.0E-01	1.7E-01	No	S	S
AP-7538	T	7	7	2.3E-01	1.7E-01	No	S	S
CH-MP2	T	8	8	2.4E+00	2.4E+00	No	S	D
CH-MP5	T	8	6	5.8E-02	5.0E-02	No	S	S
CH-MP6	T	8	8	1.2E+00	8.7E-01	No	PI	NT
CH-MP9	T	8	8	2.5E+00	2.3E+00	No	PI	PI
GWP-130	S	7	7	2.1E+00	2.3E+00	No	I	I
GWP-131	T	8	8	6.6E-01	6.0E-01	No	S	S
GWP-148	T	8	8	7.4E-01	7.1E-01	No	S	S
GWP-149	T	8	8	1.0E-01	8.8E-02	No	NT	PI
GWP-2001C	T	8	8	2.6E+00	2.3E+00	No	NT	NT
GWP-2003B	S	7	7	2.3E+00	2.1E+00	No	NT	NT
GWP-2003E	S	8	8	6.0E-01	5.4E-01	No	NT	NT

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); No Detectable Concentration (NDC)

The Number of Samples and Number of Detects shown above are post-consolidation values.

MAROS Statistical Trend Analysis Summary

Project: ROLF Benzene 2014

User Name: FES

Location: Fort Wainwright

State: Alaska

Time Period: 6/1/2008 **to** 10/24/2014

Consolidation Period: No Time Consolidation

Consolidation Type: Average

Duplicate Consolidation: Average

ND Values: Detection Limit

J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Average Conc. (mg/L)	Median Conc. (mg/L)	All Samples "ND" ?	Mann-Kendall Trend	Linear Regression Trend
BENZENE								
1144-MP8	S	9	9	3.9E-03	4.4E-03	No	I	I
AP-10028	S	9	9	7.3E-03	7.1E-03	No	D	D
AP-6064	T	11	11	8.4E-03	3.9E-03	No	NT	NT
CH-MP5	S	9	4	6.9E-03	1.0E-04	No	NT	NT
VPA-MP2	T	11	11	1.3E-02	7.4E-03	No	NT	NT
VPA-MP5	T	11	10	1.2E-02	2.5E-03	No	I	I

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); No Detectable Concentration (NDC)

The Number of Samples and Number of Detects shown above are post-consolidation values.

OU-3 Remedial Area 3 FEP Mileposts 2.7 and 3.0

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WELL ACTIVITIES				
ORIGINAL WELL ID	YEAR INSTALLED	REPLACED OR REFURBISHED	CURRENT WELL ID	YEAR REPLACED OR REFURBISHED
MILEPOST 2.7				
AP-7818/AP-9084	1999	REPLACED	AP-10301MW	2004/2015
AP-6034	1993	REFURBISHED/REPLACED	AP10300MW	2008/2015
AP-6035	1993	REFURBISHED	AP-6035	2008
AP-6036	1993	REPLACED	AP-6036R	2008
AP-5651	1991	REPLACED	AP-5651R	2009
AP-8707	2003	REPLACED	AP-10302MW	2015
MILEPOST 3.0				
AP-7821	1999	REPLACED	AP-9077	2004
AP-6040	1993	REPLACED	AP-6040R	2008
AP-7822	1999	REPLACED	AP-7822R	2008
AP-8712	2003	REPLACED	AP-10299MW	2008/2015
AP-7820	1999	REPLACED	AP-7820R	2009
AP-5850	1992	REPLACED	AP-10298MW	2015
AP-6039	1993	REPLACED	AP-10297MW	2015

LEGEND:

- AP-6039 — MONITORING WELL COMPLETED ABOVE BEDROCK
- AP-8711 — MONITORING WELL COMPLETED IN BEDROCK
- AP-8709 — MONITORING WELL DECOMMISSIONED IN 2009
- bgs — BELOW GROUND SURFACE
- DCA — 1,2-DICHLOROETHANE
- EDB — 1,2-DIBROMOETHANE
- EBZ — ETHYLBENZENE
- NA — ANALYSIS NOT PERFORMED
- ND — NOT DETECTED (DETECTION LIMIT)
- NM — NOT MEASURED
- R — REPLACEMENT WELL

KEY:

MONITORING WELL

SCREENED INTERVAL DEPTH IN FEET bgs

SEE LEGEND FOR ABBREVIATIONS.

ELEVATIONS IN FEET MEAN SEA LEVEL (NGVD '29 DATUM)

AP-5522 14-24 bgs	MAR 2000	SEPT 2000	JULY 2001
DCA	ND(1)	ND(1)	ND(2)
EDB	**1.2**	**1.77**	**1.23**
BENZENE	**11.1**	**14.2**	**7.28**
TOLUENE	19.3	14.3	8.6
EBZ	**706**	**739**	417
WATER ELEVATIONS	460.86	461.74	460.60

CONCENTRATIONS EXCEEDING REMEDIAL ACTION GOALS SHOWN IN BOLD

WATER ELEVATIONS

CONCENTRATIONS IN MICROGRAMS PER LITER ($\mu g/L$)

MCLs IN $\mu g/L$

5	DCA
0.05	EDB
5	BENZENE
1,000	TOLUENE
700	EBZ

AWQS IN $\mu g/L$

1,500	DRO
2,200	GRO

NOTES:

1. NA*** DENOTES SAMPLING EVENTS WHEN WELLS WERE NOT SAMPLED DUE TO PERMAFROST
2. ADEC CLEANUP LEVELS FOR GRO INCREASED TO 2,200 ug/L in 2008
3. *REPLACEMENT WELLS WERE INSTALLED IN 2004 AND 2015. RESULTS FROM 2004/2015 AND AFTER ARE FROM SAMPLES COLLECTED FROM REPLACEMENT WELLS. ALL OTHER RESULTS ARE FROM THE GROUNDWATER PROBE SHOWN IN PARENTHESES.
4. REPLACEMENT WELLS WERE INSTALLED IN 2009 FOR AP-5651 AND AP-7820.
5. DECOMMISSIONED WELLS AP-5845, FWD-225, FWD-226 AND FWD-227 WERE LOCATED FROM 1,000 FEET TO 4,000 FEET EAST OF AP-5651R.
6. ONE REMEDIATION TRENCH COMPLETED AT MILEPOST 2.7 AND THREE REMEDIATION TRENCHES COMPLETED AT MILEPOST 3.0 AS PART OF THE IEDD TREATABILITY STUDY IN FALL 2009.
7. DRO ANALYSIS DISCONTINUED IN 2010.

0 100 200

Scale in Feet

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Monitoring Locations and Concentrations of ROD COC's at Milepost 2.7 and 3.0 Source Areas

2015 Monitoring Report
Operable Unit 3
Fort Wainwright, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-12-D-0001	4-2	4/16

2015 MP

Table 5-19
2015 Groundwater Analytical Data
Milepost 2.7

				1	3	5	9	11	13	
			Location ID	AP-7817	AP-6036R	AP-10300MW	AP-5651R	AP-10302MW	AP-6035	AP-10301MW
			Collection Date	8/19/2015	8/19/2015	8/19/2015	8/19/2015	8/19/2015	8/19/2015	8/19/2015
			Matirx	WG	WG	WG	WG	WG	WG	WG
			Sample Type	primary	primary	primary/MS/MSD	primary	primary	primary	
Analyte	Method	Units	Cleanup Level1	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier
Gasoline Range Organics (C6-C10)	AK101	UG/L	2,200.00	**5700 [25]**	1300 [25]	**4700 [25]**	**3700 [25]**	**3600 [25]**	2000 [25]	**57000 [250]**
Sulfate	E300.0	MG/L	NE	0.67 [0.1]	8.3 [0.2]	4.8 [0.2]	1.2 [0.2]	2 [0.2]	0.64 [0.1]	3.9 [0.2]
Iron	SW6010C	UG/L	NE	37100 [10.6]	4590 [10.6]	7990 [10.6]	31600 [10.6]	40800 [10.6]	45000 [10.6]	38000 [10.6]
Benzene	SW8260C	UG/L	5.00	**30 [0.5]**	**13 [0.1]**	**170 [1]**	**8.2 [0.1]**	**220 [1]**	**160 [1]**	**7000 [50]**
Toluene	SW8260C	UG/L	1,000.00	2 [0.5] J	11 [0.1]	98 [1]	8 [0.1]	2.2 [0.1]	1.1 [0.1]	**11000 [50]**
Ethylbenzene	SW8260C	UG/L	700.00	340 [0.5]	6.5 [0.1]	87 [1]	97 [1]	44 [0.1]	42 [0.1]	650 [5]
1,2-Dibromoethane	SW8260C	UG/L	0.05	ND [1] U	ND [0.2] U	ND [0.2] U	ND [0.2] U	ND [0.2] U	ND [0.2] U	**0.1 [0.004]**
1,2-Dichloroethane	SW8260C	UG/L	5.00	ND [0.75] U	ND [0.15] U	ND [0.15] U	ND [0.15] U	ND [0.15] U	ND [0.15] U	4.5 [7.5] J
1,2,4-Trimethylbenzene	SW8260C	UG/L	1,850.00	31 [1]	8.1 [0.2]	73 [2]	120 [2]	59 [0.2]	41 [0.2]	420 [10]
1,3,5-Trimethylbenzene	SW8260C	UG/L	1,800.00	12 [1]	3.5 [0.2]	49 [0.2] J	51 [0.2]	23 [0.2]	16 [0.2]	130 [10]

Table 5-19
2015 Groundwater Analytical Data
Milepost 3.0

				1	5	7	9	11	13	15	19	21	23	25	27	29
			Location ID	AP-7820R	AP-5522	AP-9079	AP-9078	AP-10299MW	AP-9077	AP-8711	AP-6040R	AP-10035	AP-10036	AP-10298MW	AP-10297MW	AP-8710
			Collection Date	8/17/2015	8/17/2015	8/17/2015	8/17/2015	8/18/2015	8/17/2015	8/17/2015	8/18/2015	8/18/2015	8/18/2015	8/18/2015	8/18/2015	8/19/2015
			Matirx	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
			Sample Type													
Analyte	Method	Units	Cleanup Level1	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier	Result [LOD] Qualifier
Gasoline Range Organics (C6-C10)	AK101	UG/L	2,200.00	70 [25] J	**8000 [25]**	25 [25] J	280 [25]	350 [25]	**9400 [250]**	440 [25]	55 [25] J	**11000 [250]**	530 [25]	1000 [25]	ND [25] U	ND [25] U
Sulfate	E300.0	MG/L	NE	2.1 [0.2]	55.9 [0.2]	16.2 [0.2]	43.4 [0.2]	1.5 [0.2]	0.72 [0.1]	43.7 [0.2]	29.6 [0.2]	32.4 [0.2]	1.9 [0.2]	15 [0.2]	0.65 [0.1]	5.7 [0.2]
Iron	SW6010C	UG/L	NE	9930 [10.6]	1580 [10.6]	4.2 [10.6] J	31.5 [10.6]	30800 [10.6]	58900 [10.6]	10.9 [10.6] J	17800 [10.6]	43700 [10.6]	73400 [10.6]	9280 [10.6]	614 [10.6]	32.2 [10.6]
Benzene	SW8260C	UG/L	5.00	**15 [0.1]**	**700 [2.5]**	ND [0.1] U	1.9 [0.1]	**23 [0.1]**	**5900 [20]**	**6 [0.1] J**	**26 [0.1]**	**6400 [20]**	**230 [1]**	**55 [0.1]**	ND [0.1] U	ND [0.1] U
Toluene	SW8260C	UG/L	1,000.00	0.22 [0.1] J	180 [0.25]	0.08 [0.1] J	0.07 [0.1] J	2.9 [0.1]	9 [2] J	0.07 [0.1] J	0.06 [0.1] J	1.8 [2] J	1 [0.1]	0.21 [0.1] J	ND [0.1] U	0.42 [0.1] J
Ethylbenzene	SW8260C	UG/L	700.00	0.64 [0.1]	1.7 [0.25]	ND [0.1] U	ND [0.1] U	2.9 [0.1]	51 [2]	ND [0.1] U	0.1 [0.1] J	19 [2]	1.1 [0.1]	8.3 [0.1]	ND [0.1] U	0.17 [0.1] J
1,2-Dibromoethane	E504.1	UG/L	0.05	ND [0.004] U	**37 [0.4]**	0.02 [0.004]	ND [0.004] U	ND [0.004] U	ND [0.004] U	**2.7 [0.08]**	0.0065 [0.004] J	ND [0.004] U	ND [0.004] U	0.0094 [0.004] J	ND [0.004] U	ND [0.004] U
1,2-Dichloroethane	SW8260C	UG/L	5.00	ND [0.15] U	0.2 [0.38] J	ND [0.15] U	0.16 [0.15] J	0.15 [0.15] J	4.8 [3] J	0.16 [0.15] J	ND [0.15] U	**7.8 [3] J**	3.4 [0.15]	ND [0.15] U	ND [0.15] U	ND [0.15] U
1,2,4-Trimethylbenzene	SW8260C	UG/L	1,850.00	0.18 [0.2] J	14 [0.5]	ND [0.2] U	ND [0.2] U	3.1 [0.2]	ND [4] U	ND [0.2] U	0.3 [0.2] J	ND [4] U	0.39 [0.2] J	7.7 [0.2]	ND [0.2] U	ND [0.2] U
1,3,5-Trimethylbenzene	SW8260C	UG/L	1,800.00	ND [0.2] U	8 [0.5]	ND [0.2] U	ND [0.2] U	0.34 [0.2] J	ND [4] U	ND [0.2] U	ND [0.2] U	ND [4] U	0.12 [0.2] J	6.5 [0.2]	ND [0.2] U	ND [0.2] U

OU-4 Landfill

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OU-4 Landfill Groundwater Monitoring Results and Analysis

Monitoring Results and Data Review

Groundwater monitoring data for site contaminants of concern (COCs), since the completion of the remedial action in September 1997, is presented in the attached table. The data was reviewed to evaluate progress towards attaining the remedial action objectives (RAOs) identified in the OU-4 Record of Decision (U.S. Army 1996b). Figure 3-2 illustrates well locations and groundwater contours for October 2014. Figure 3-3 provides a spatial summary of analytical results for wells that are monitored.

The monitoring well network includes six shallow wells (AP-5588, AP-8061, AP-10257, AP-10258, AP-10259, and FWLF-4), three intermediate wells (AP-5589, AP-6136, and AP-6138), and four deep wells (AP-6530, AP-6532, AP-6535, and AP-8063).

Nine of the 13 monitoring wells sampled contained one or more COC above the cleanup goals. Trend analysis was performed to augment and verify assessments provided in the annual sampling reports. The analysis consisted of preparing trend plots and evaluation using the Mann-Kendall test, a statistical procedure used to evaluate the significance of trends in contaminant concentrations. Results are discussed below.

<u>Shallow Zone Wells</u>

- **AP-5588** – this well is located immediately downgradient of the capped Landfill Source Area; it has been sampled since the remedial action was implemented. 1,1,2,2-PCA, TCE, and cis 1,2-DCE have consistently been detected above the site cleanup goals. 1,1,2-TCA has frequently been detected above the cleanup goal. Bis(2-ethylhexyl)phthalate was detected above the cleanup goal on two occasions; May 2003 and May 2008. No trends are observed for 1,1,2,2-PCA, 1,1,2-TCA, and vinyl chloride. TCE, cis 1,2-DCE, and benzene concentrations exhibit decreasing trends.
- **AP-8061** – this well is located downgradient of the capped Landfill Source Area and well AP-5588. It has been sampled consistently since September 2001. TCE has been frequently detected above the cleanup goal and benzene has been frequently detected above the cleanup goal prior to October 2011. Bis(2-ethylhexyl)phthalate was detected above the cleanup goal on one occasion, May 2003. No trend is observed for benzene. Downward trends are observed for TCE and cis 1,2-DCE.
- **AP-10257** – this well is located upgradient of the capped Landfill Source Area. It has been sampled during four monitoring events since November 2012. Benzene has been detected above the cleanup goal three occasions. Not enough data is available to evaluate trends.
- **AP-10258** – this well is located upgradient of the capped Landfill Source Area. It has been sampled during four monitoring events since November 2012. Benzene was detected above the cleanup goal on one occasion (October 2014). Not enough data is available to evaluate trends.
- **AP-10259** – this well is located upgradient of the capped Landfill Source Area. It has been sampled during four monitoring events since November 2012. No COCs have been detected above the cleanup goals.

- **FWLF-4** – this well is located immediately upgradient of the capped Landfill Source Area; it has been sampled since the remedial action was implemented. Bis(2-ethylhexyl)phthalate was detected above the cleanup goal on two occasions, December 1998 and May 2003. A downward trend is observed for benzene.

Results indicate that the highest COC concentrations and most frequent detections occur in AP-5588, which is immediately downgradient of the capped Landfill Source Area; COC concentrations decrease with distance downgradient. Decreasing trends are observed for TCE and cis 1,2-DCE in both downgradient wells and for benzene in AP-5588.

Data presented in the 2014 annual sampling report indicate that dissolved oxygen (DO) in the downgradient shallow wells was typically below 1 milligram per liter (mg/L) and that oxidation reduction potential (ORP) varied from approximately 50 millivolts (mV) to -60 mV (FES 2015f). Dissolved iron and sulfate in the downgradient wells were elevated with respect to background. Geochemical conditions are anoxic and suggest that manganese reducing to iron reducing conditions may be present. These conditions are suitable for reductive dechlorination of PCA, TCA, TCE, and DCE.

<u>Intermediate Zone Wells</u>

- **AP-5589** – this well is located immediately downgradient of the capped Landfill Source Area; it has been sampled since the remedial action was implemented. 1,1,2,2-PCA, TCE, vinyl chloride, and bis(2-ethylhexyl)phthalate have occasionally been detected above the cleanup goals. Upward trends are observed for TCE and cis 1,2-DCE. Downward trends are observed for vinyl chloride and benzene.
- **AP-6136** – this well is located immediately downgradient of the capped Landfill Source Area; it has been sampled since the remedial action was implemented. No COCs have been detected above the cleanup goals.
- **AP-6138** - this well is located downgradient of the capped Landfill Source Area and wells AP-5589 and AP-6136. It has been sampled since the remedial action was implemented. Bis(2-ethylhexyl)phthalate was detected above the cleanup goal on two occasions, December 1998 and August 1999. A downward trend is observed for benzene.

Results indicate that the highest concentrations of chlorinated VOCs and the most frequent detections occur in AP-5589, which is immediately downgradient of the capped Landfill Source Area. The concentrations decrease with distance downgradient. TCE and cis 1,2-DCE are increasing in AP-5589, while vinyl chloride and benzene are decreasing. Benzene is also decreasing in AP-8061. Bis(2-ethylhexyl)phthalate occurs most frequently and at the highest relative concentrations in AP-6136 and AP-6138.

Data presented in the 2014 annual sampling report indicate that DO in the downgradient intermediate wells was typically below 1 mg/L and that ORP varied from approximately 50 mV to -72 mV (FES 2015l). Dissolved iron and sulfate in the downgradient wells were elevated with respect to background. Geochemical conditions in the intermediate zone are anoxic and suggest that manganese reducing to iron reducing conditions may be present. These conditions are suitable for anaerobic reductive dechlorination of TCE to cis-1,2-DCE, which may explain the increasing concentrations at AP-5589. The increasing TCE concentrations at this location may be a result of abiotic transformation of 1,1,2,2-TCA or a residual TCE plume from beneath the landfill.

Deep Zone Wells

- **AP-6530** – this well is located downgradient of the capped Landfill Source Area and wells AP-6532 and AP-8063. It has been sampled since October 2010. Benzene was detected above the cleanup goal on three occasions. Bis(2-ethylhexyl)phthalate was detected above the cleanup goal on one occasion. No trend is observed for benzene.
- **AP-6532** – this well is located downgradient of the capped Landfill Source Area. It has been sampled since the remedial action was implemented. Benzene has been frequently detected above the cleanup goal. Bis(2-ethylhexyl)phthalate was detected above the cleanup level on five occasions. An upward trend is observed for benzene.
- **AP-6535** – this well is located downgradient of the capped Landfill Source Area and wells AP-6532 and AP-8063. It has been sampled since October 2010. No COCs have been detected above the cleanup goals. No trends are observed for TCE, cis-1,2-DCE, vinyl chloride, benzene, and bis(2-ethylhexyl)phthalate.
- **AP-8063** – this well is located downgradient of the capped Landfill Source Area. It has been sampled since September 2001. 1,1,2,2-PCA, TCE, and cis 1,2-DCE have been frequently detected above the cleanup goals. Vinyl chloride was detected above the cleanup goals on two occasions, June 2006 and October 2007. Bis(2-ethylhexyl) phthalate was detected above the cleanup goal on four occasions. Upward trends are observed for TCE and cis 1,2-DCE. Downward trends are observed for vinyl chloride and benzene. No trend is observed for 1,1,2,2-PCA.

Results indicate that the highest concentrations of chlorinated VOCs and the most frequent detections occur in AP-8063, which is the closest downgradient well to the capped landfill. The concentrations decrease with distance downgradient. TCE and cis-1,2-DCE are increasing, 1,1,2,2-PCA exhibits no trend, and vinyl chloride and benzene are decreasing in AP-8063. Benzene occurs most frequently and at the highest relative concentrations in AP-6532; where the concentrations are increasing. This well is north of AP-8063. Benzene is also increasing in AP-6530, although the assessment is based on a small number of samples (seven).

Data presented in the 2014 annual sampling report indicate that DO in the downgradient deep wells was typically below 1 mg/L and that ORP varied from approximately 20 mV to -71 mV (FES 2015l). Dissolved iron and sulfate in the downgradient wells were elevated with respect to background. Geochemical conditions in the deep zone are anoxic and suggest that manganese reducing to iron reducing conditions may be present. These conditions are suitable for anaerobic reductive dechlorination of TCE to cis-1,2-DCE, which may explain the increasing concentrations at AP-8063. The increasing TCE concentrations at this location may be a result of abiotic transformation of 1,1,2,2-TCA or a residual TCE plume from beneath the landfill.

Comparison to the 2014 Annual Sampling Report

The 2014 Annual Sampling Report (FES 2015l) provided the following long-term monitoring recommendations that were established by the remedial project managers during a February 2015 Federal Facility Agreement meeting:

Shallow Zone Wells

- AP-5588 – conduct annual monitoring during the spring season because results do not vary significantly between the spring and fall sampling events

- FWLF-4 – conduct annual monitoring during the spring season because COCs have not exceeded the cleanup levels since 2003
- AP-8061 – conduct annual monitoring during the spring and fall seasons
- AP-10257 – conduct annual monitoring during the spring and fall seasons to evaluate the presence of benzene in groundwater upgradient of the landfill
- AP-10258 – conduct annual monitoring during the spring and fall seasons to evaluate the presence of benzene upgradient of the landfill
- AP-10259 – discontinuing monitoring because no COCs have been detected for four consecutive sampling events

This five-year review agrees with these recommendations; no other opportunities for optimization were identified.

Intermediate Zone Wells

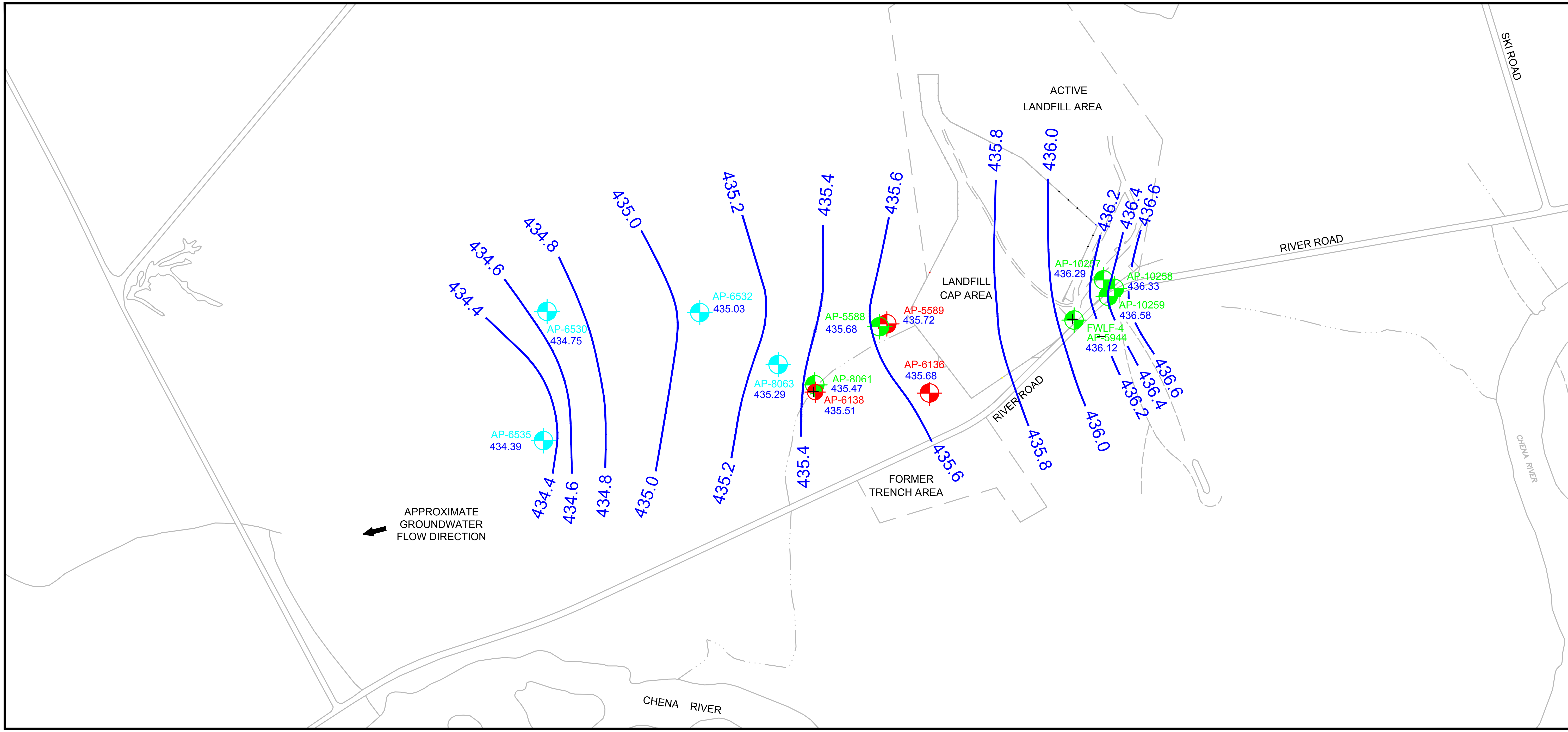
- AP-5589 – conduct annual monitoring during the spring season to evaluate bis(2-ethylhexyl)phthalate that was detected above the cleanup level in June 2013
- AP-6136 – discontinue monitoring because COCs have not been detected or detected at low concentrations below the cleanup levels since 2006
- AP-6138 – discontinue monitoring because COCs have not been detected or detected at low concentrations below the cleanup levels since 2006

This five-year review agrees with these recommendations; no other opportunities for optimization were identified.

Deep Zone Wells

- AP-8063 – conduct annual monitoring during the spring season because results do not vary significantly between the spring and fall sampling events
- AP-6530 – conduct annual monitoring during the spring and fall seasons
- AP-6532 – conduct annual monitoring during the spring and fall seasons
- AP-6535 – conduct annual monitoring during the spring and fall seasons

This five-year review agrees with these recommendations; no other opportunities for optimization were identified.



LEGEND

AP-6318 435.51	INTERMEDIATE WELLS <90 FEET (WITH GROUNDWATER ELEVATION)	AP-5588 435.68	SHALLOW WELLS <30 FEET (WITH GROUNDWATER ELEVATION)
AP-6535 434.39	DEEP WELLS >90 FEET (WITH GROUNDWATER ELEVATION)		OCTOBER 2014 GROUNDWATER CONTOURS

NORTH

0 250 500 1,000

SCALE IN FEET

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

October 2014 Groundwater Contours at the Landfill

2014 Annual Sampling Report
Operable Unit 4
Fort Wainwright, Alaska

CONTRACT: W911KB-12-D-0001 | FIGURE: 3-2 | DATE: 6/15

WELL AP-6854
Top of PVC 449.17
Total Well Depth (ft) 100

	OCT 10
Groundwater Elevation (feet)	434.27
Benzene	0.44
cis-1,2-Dichloroethene	ND(1.0)
1,1,2,2-Tetrachloroethane	ND(1.0)
1,1,2-Trichloroethane	ND(1.0)
Trichloroethene	ND(1.0)
Vinyl Chloride	ND(1.0)
bis (2-ethylhexyl)phthalate	ND(4.8)
Methane	14,000

WELL AP-6854A
Top of PVC 450.06
Total Well Depth (ft) 64.8

	OCT 10
Groundwater Elevation (feet)	434.26
Benzene	0.45
cis-1,2-Dichloroethene	ND(1.0)
1,1,2,2-Tetrachloroethane	ND(1.0)
1,1,2-Trichloroethane	ND(1.0)
Trichloroethene	ND(1.0)
Vinyl Chloride	0.95
bis (2-ethylhexyl)phthalate	ND(4.8)
Methane	14,000

WELL AP-6527
Top of PVC UNKNOWN
Total Well Depth (ft) 180.35

	AUG 11	NOV 12
Groundwater Elevation (feet)	UNKNOWN	UNKNOWN
Benzene	1.2	1.5
cis-1,2-Dichloroethene	ND(1.0)	ND(2)
1,1,2,2-Tetrachloroethane	ND(1.0)	ND(0.4)
1,1,2-Trichloroethane	ND(1.0)	ND(0.4)
Trichloroethene	ND(1.0)	ND(2)
Vinyl Chloride	ND(1.5)	ND(0.8)
bis (2-ethylhexyl)phthalate	ND(300)	**13**
Methane	1.9	10

WELL AP-10257
Top of PVC 454.01
Total Well Depth (ft) 24.45

	NOV 12	JUNE 13	SEPT 13	OCT 14
Groundwater Elevation (feet)	434.51	436.22	434.40	436.31
Benzene	**14**	3.4	**17**	**6.6**
cis-1,2-Dichloroethene	3.9	1.6	3.9	2.0
1,1,2,2-Tetrachloroethane	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)
1,1,2-Trichloroethane	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)
Trichloroethene	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.4)
Vinyl Chloride	ND(0.8)	ND(0.4)	ND(0.4)	ND(0.4)
bis (2-ethylhexyl)phthalate	1.1	1.1	1.1	ND(2.0)
Methane	1,400	46	1,200	300

WELL AP-10258
Top of PVC 453.54
Total Well Depth (ft) 18.90

	NOV 12	JUNE 13	SEPT 13	OCT 14
Groundwater Elevation (feet)	434.64	436.22	434.42	436.29
Benzene	ND(0.2)	0.40	2.7	**5.7**
cis-1,2-Dichloroethene	0.45	0.39	1.7	2.5
1,1,2,2-Tetrachloroethane	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)
1,1,2-Trichloroethane	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)
Trichloroethene	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)
Vinyl Chloride	ND(0.8)	ND(0.4)	ND(0.4)	ND(0.4)
bis (2-ethylhexyl)phthalate	0.98	0.76	ND(0.26)	ND(2.9)
Methane	15	44	160	280

WELL AP-10259
Top of PVC 453.95
Total Well Depth (ft) 19.20

	NOV 12	JUNE 13	SEPT 13	OCT 14
Groundwater Elevation (feet)	434.75	436.31	434.44	436.57
Benzene	0.72	0.7	0.18	ND(0.4)
cis-1,2-Dichloroethene	0.45	0.37	ND(0.2)	ND(0.4)
1,1,2,2-Tetrachloroethane	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)
1,1,2-Trichloroethane	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)
Trichloroethene	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.4)
Vinyl Chloride	ND(0.8)	ND(0.4)	ND(0.4)	ND(0.4)
bis (2-ethylhexyl)phthalate	0.97	1.3	ND(0.26)	ND(2.0)
Methane	27	50	17	0.25

WELL AP-6530
Top of PVC 450.06
Total Well Depth (ft) 142.2

	OCT 10	JULY 11	OCT 11	NOV 12	JUNE 13	SEPT 13	OCT 14
Groundwater Elevation (feet)	432.96	435.43	434.08	434.26	434.84	434.24	434.81
Benzene	0.69	**5.7**	4.2	2.5	**5.8**	**5.0**	3.2
cis-1,2-Dichloroethene	ND(1.0)	1.6	0.90	0.54	1.8	1.6	0.42
1,1,2,2-Tetrachloroethane	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	0.89
1,1,2-Trichloroethane	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)
Trichloroethene	ND(1.0)	ND(1.0)	ND(1.0)	ND(2)	ND(0.2)	ND(0.2)	ND(0.4)
Vinyl Chloride	ND(1.0)	ND(1.5)	ND(1.5)	ND(0.8)	0.31	0.27	ND(0.4)
bis (2-ethylhexyl)phthalate	ND(52)	0.43	0.50	1.1	1.3	1.1	**27**
Methane	290	2,100	1,400	570	2,800	3,900	530

WELL AP-6534
Top of PVC 450.15
Total Well Depth (ft) 198.4

	OCT 10	JULY 11
Groundwater Elevation (feet)	433.42	435.57
Benzene	1.9	1.2
cis-1,2-Dichloroethene	ND(1.0)	ND(1.0)
1,1,2,2-Tetrachloroethane	ND(1.0)	ND(1.0)
1,1,2-Trichloroethane	ND(1.0)	ND(1.0)
Trichloroethene	ND(1.0)	ND(1.0)
Vinyl Chloride	ND(1.0)	ND(1.5)
bis (2-ethylhexyl)phthalate	ND (5.2)	0.61
Methane	140	150

WELL AP-6535
Top of PVC 448.09
Total Well Depth (ft) 93.1

	OCT 10	JULY 11	NOV 12	JUNE 13	SEPT 13	OCT 14
Groundwater Elevation (feet)	431.7	435.09	434.04	434.70	434.10	434.39
Benzene	3.6	3.4	3.1	3.3	2.1	3.3
cis-1,2-Dichloroethene	33	34	31	33	22	34
1,1,2,2-Tetrachloroethane	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)
1,1,2-Trichloroethane	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)
Trichloroethene	0.65	0.57	0.58	0.95	0.33	0.73
Vinyl Chloride	0.9	1.1	1.0	0.86	0.66	1.1
bis (2-ethylhexyl)phthalate	1.4	0.49	1.6	1.1	0.95	2.3
Methane	1,000	810	1,600	1,100	2,100	1,800

WELL AP-5997
Top of PVC Unknown
Total Well Depth (ft) 25.8

	JULY 11
Groundwater Elevation (feet)	UNKNOWN
Benzene	ND(1.0)
cis-1,2-Dichloroethene	ND(1.0)
1,1,2,2-Tetrachloroethane	ND(1.0)
1,1,2-Trichloroethane	ND(1.0)
Trichloroethene	ND(1.0)
Vinyl Chloride	ND(1.0)
bis (2-ethylhexyl)phthalate	0.35
Methane	7.4

WELL AP-5589
Top of PVC 452.30
Total Well Depth (ft) 56.2

WELL AP-5588
Top of PVC 451.28
Total Well Depth (ft) 29.03

WELL FW-LF-4
Top of PVC 452.26
Total Well Depth (ft) 25.1

WELL AP-6132
Top of PVC 456.06
Total Well Depth (ft) 23.7

WELL AP-6136
Top of PVC 454.14
Total Well Depth (ft) 96.1

WELL AP-8061
Top of PVC 444.30
Total Well Depth (ft) 25.2

WELL AP-6532
Top of PVC 451.38
Total Well Depth (ft) 177.2

* NO ELEVATION GIVEN FOR TOP OF CASING.

WELL AP-8063
Top of PVC 451.36
Total Well Depth (ft) 120.55

NS = NO SAMPLE COLLECTED BECAUSE WELL WAS FROZEN DURING SAMPLING EVENT.

WELL AP-6138
Top of PVC 444.92
Total Well Depth (ft) 85.91

* MEASUREMENT NOT TAKEN.
NS = WELL NOT SAMPLED, WELL STRUCTURE COMPROMISED.
NE = REPLACE TOP 10 FEET OF PVC WITH STAINLESS STEEL CASING, THEREFORE CHANGING TOC ELEVATION.

LEGEND

- AP-6138 MONITORING WELL
- PRIMARY ROAD
- SECONDARY ROAD
- BOUNDARY
- DRAINAGE
- TRAIL
- ND INDICATES THAT THE ANALYTE WAS NOT DETECTED, THE PRACTICAL QUANITATION LIMIT IS STATED IN PARENTHESES.

RAOs IN $\mu g/L$

5	Benzene
70	cis-1,2-Dichloroethene
5.2	1,1,2,2-Tetrachloroethane
5	1,1,2-Trichloroethane
5	Trichloroethene
2	Vinyl Chloride
6	bis (2-ethylhexyl)phthalate
NA	Methane

KEY:

MONITORING WELL

WELL AP-8063
TOP OF PVC 451.13
Total Well Depth (ft) 121.3

	SEP 01	JUN 02	OCT 02	JUN 03	SEP 03	JUN 04
Groundwater Elevation (feet)	434.34	NS	435.03	434.21	436.79	436.79
Benzene	4.5	NS	3.39	3.44	3.46	3.01
cis-1,2-Dichloroethene	**72**	NS	43.5	**74.8**	**70.5**	69.6
1,1,2,2-Tetrachloroethane	**51**	NS	**49.6**	**33.6**	**77.4**	**9.60**
1,1,2-Trichloroethane	0.85 J	NS	0.84 J	0.64 J	0.97 J	ND(1.0)
Trichloroethene	**24**	NS	**16.5**	**22.5**	**28.2**	**17.3**
Vinyl Chloride	**2.1**	NS	1.1	1.48	1.91 J	1.58
bis (2-ethylhexyl)phthalate	ND (5.3)	NS	ND(20)	**41 B**	ND(16)	ND(10)

CONCENTRATIONS EXCEEDING REMEDIAL ACTION GOALS SHOWN IN BOLD

CONCENTRATIONS IN MICROGRAMS PER LITER ($\mu g/L$)

NS = NO SAMPLE COLLECTED BECAUSE WELL WAS FROZEN DURING SAMPLING EVENT.

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Concentrations of Analytes in Groundwater at the Landfill Source Area

2014 Annual Sampling Report
Operable Unit 4
Fort Wainwright, Alaska

CONTRACT: W911KB-12-D-0001
FIGURE: 3-3
DATE: 6/15

OU4 - Landfill
Groundwater Monitoring Results

Well/Constituent	Unit	Cleanup Goal	Jul-97	Dec-98	Mar-99	Jun-99	Aug-99	Mar-00	Aug-00	Mar-01	Sep-01	Jun-02	Oct-02	May-03	Sep-03	Jun-04	Oct/Nov-04	May-05	Oct-05	Jun-06	Oct-06	May-07	Oct-07	May-08	Sep-08	Jun-09	Nov-09	May-10	Oct-10	Jul-11	Oct-11	Nov-12	Jun-13	Sep-13	Oct-14
AP-5588	Zone:	Shallow		Location:	Downgradient																														
1,1,2,2-Tetrachloroethane	µg/L	5.2	1,700	2,020	2,400	1,920	1,570	2,130	2,180	2,000	1,300	934	1,260	1,990	1,820	2,590	2,990	1,600	2,820	2,870	2,600	378	2,840	1,200	1,600	2,300	2,600	2,800	2,400	890	950	830	940	980	1,300
1,1,2-Trichloroethane	µg/L	5	8.0	10.2	11.0	9.92	9.41	10.1	9.71	10.0	7.7	5.46	7.1	9.52	9.53	11.8	13.2	7.58	12.4	13.8	13	13.9	10.4	6.0	7.4	9.2	ND(50)	73	ND(50)	5.2	5.7	6.2	4.7	4.2	5.4
Benzene	µg/L	5	2.00	2.27	2.00	2.42	3.07	2.26	2.29	2.50	2.10	1.64	2.37	1.93	ND(4.0)	2.25	2.09	2.49	2.42	2.52	2.10	1.12	0.34	2.60	2.30	2.20	ND(50)	2.20	ND(50)	2.6	1.9	2.0	1.4	1.5	0.76
bis(2-Ethylhexylphthalate)	µg/L	6	ND(11)	ND(11)	0.60	NA	ND(11)	ND(10)	ND(11)	3.40	ND(5.1)	ND(21)	ND(20)	7.30	ND(16)	ND(9.3)	ND(10)	ND(10)	ND(10)	ND(9.7)	ND(17)	ND(3.23)	ND(11.8)	7.20	0.74	ND(0.15)	ND(9.6)	0.63	ND(4.8)	0.53	ND(5)	1.1	0.69	ND(0.27)	ND(3)
cis 1,2-Dichloroethene	µg/L	70	160	170	190	184	176	173	168	160	220	117	127	162	121	183	168	133	160	169	200	ND(25)	148	150	150	170	190	180	190	140	130	120	110	110	120
Trichloroethene	µg/L	5	280	196	320	243	252	271	257	440	240	168	193	248	203	314	295	205	279	305	320	31.0	290	170	180	310	310	260	360	170	190	170	130	140	190
Vinyl Chloride	µg/L	2	ND(1.0)	ND(1.0)	ND(1.0)	1.11	1.37	1.17	1.31	1.10	1.30	ND(1.0)	1.33	0.88	ND(10)	1.21	1.45	1.49	1.52	2.42	ND(10)	1.42	1.06	1.30	1.10	1.20	ND(50)	0.51	ND(50)	1.5	1.1	ND(0.4)	0.51	0.96	0.4
AP-8061	Zone:	Shallow		Location:	Downgradient																														
1,1,2,2-Tetrachloroethane	µg/L	5.2	NA	NA	NA	NA	NA	NA	NA	NA	ND(2.0)	1.5	3.85	2.92	3.05	1.05	ND(0.5)	ND(0.5)	ND(0.5)	0.24	ND(1.0)	ND(0.5)	ND(0.5)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	1.9	ND(1.0)	ND(1.0)	ND(1.0)	0.71	ND(0.4)	ND(0.4)	ND(0.4)
1,1,2-Trichloroethane	µg/L	5	NA	NA	NA	NA	NA	NA	NA	NA	ND(2.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)
Benzene	µg/L	5	NA	NA	NA	NA	NA	NA	NA	NA	5.0	2.46	4.84	3.39	5.80	3.34	5.77	3.09	5.07	5.74	5.50	5.08	5.0	4.4	5.5	4.4	5.2	4.7	5.8	5.3	4.8	4.3	2.9	3.9	3.9
bis(2-Ethylhexylphthalate)	µg/L	6	NA	NA	NA	NA	NA	NA	NA	NA	ND(5.0)	ND(22)	ND(23)	6.0	ND(17)	5.0	ND(10)	ND(10)	ND(11)	ND(9.5)	ND(16)	ND(10.4)	ND(10.5)	4.0	ND(15)	ND(15)	ND(9.7)	ND(15)	1.3	0.3	ND(5.1)	0.92	0.79	0.81	ND(1.9)
cis 1,2-Dichloroethene	µg/L	70	NA	NA	NA	NA	NA	NA	NA	NA	31	15.6	26.5	20.6	28.8	22.9	22.4	17.7	18.9	24.3	20	20.9	16	17	20	18	14	10	13	11	12	9	8.6	7.3	13
Trichloroethene	µg/L	5	NA	NA	NA	NA	NA	NA	NA	NA	11	7.86	12.9	11	13	12.3	12.3	8.74	9.2	12.7	9.6	12.7	8.11	6.8	7.6	8.9	6.6	4.8	6.2	5.8	5.9	4.6	4.4	3.8	7.8
Vinyl Chloride	µg/L	2	NA	NA	NA	NA	NA	NA	NA	NA	ND(2.0)	ND(1.0)	ND(1.0)	0.33	0.47	0.53	0.65	0.43	0.59	1.25	0.49	ND(1.0)	0.66	0.40	0.56	ND(1.0)	0.30	ND(1.0)	0.24	ND(1.5)	ND(1.5)	ND(0.8)	0.13	0.15	ND(0.4)
AP-10257	Zone:	Shallow		Location:	Upgradient																														
1,1,2,2-Tetrachloroethane	µg/L	5.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)
1,1,2-Trichloroethane	µg/L	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)
Benzene	µg/L	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	14	3.4	17	6.6
bis(2-Ethylhexylphthalate)	µg/L	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.1	1.1	1.1	ND(2.0)
cis 1,2-Dichloroethene	µg/L	70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.9	1.6	3.9	2.0
Trichloroethene	µg/L	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.4)
Vinyl Chloride	µg/L	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND(0.8)	ND(0.4)	ND(0.4)	ND(0.4)
AP-10258	Zone:	Shallow		Location:	Upgradient																														
1,1,2,2-Tetrachloroethane	µg/L	5.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)
1,1,2-Trichloroethane	µg/L	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)
Benzene	µg/L	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND(0.2)	0.4	2.7	5.7
bis(2-Ethylhexylphthalate)	µg/L	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.98	0.76	ND(0.26)	ND(2.9)
cis 1,2-Dichloroethene	µg/L	70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.45	0.39	1.7	2.5
Trichloroethene	µg/L	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)
Vinyl Chloride	µg/L	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND(0.8)	ND(0.4)	ND(0.4)	ND(0.4)
AP-10259	Zone:	Shallow		Location:	Upgradient																														
1,1,2,2-Tetrachloroethane	µg/L	5.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)
1,1,2-Trichloroethane	µg/L	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)
Benzene	µg/L	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.72	0.7	0.18	ND(0.4)
bis(2-Ethylhexylphthalate)	µg/L	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.97	1.3	ND(0.26)	ND(2.0)
cis 1,2-Dichloroethene	µg/L	70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.45	0.37	ND(0.2)	ND(0.4)
Trichloroethene	µg/L	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.4)
Vinyl Chloride	µg/L	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND(0.8)	ND(0.4)	ND(0.4)	ND(0.4)
FWLF-4	Zone:	Shallow		Location:	Upgradient																														
1,1,2,2-Tetrachloroethane	µg/L	5.2	NA	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(1.0)	ND(0.5)	ND(0.5)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)
1,1,2-Trichloroethane	µg/L	5	NA	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)
Benzene	µg/L	5	NA	1.97	2.00	1.67	1.58	1.53	1.31	1.40	1.40	0.91	1.26	1.32	1.34	1.43	1.80	1.87	1.57	1.49	1.50	1.27	ND(0.4)	1.10	0.90	1.2	1.4	1.2	1.1	0.94	0.84	0.51	0.52	0.4	1.2
bis(2-Ethylhexylphthalate)	µg/L	6	NA	15.3	2.20	NA	ND(11)	ND(10)	ND(10)	ND(5.0)	4.30	ND(22)	ND(22)	6.7	ND(16)	ND(9.3)	ND(10)	ND(10)	ND(10)	ND(9.7)	ND(16)	ND(10.8)	ND(11.1)	1.80	ND(15)	ND(15)	ND(9.6)	5.4	ND(4.8)	0.49	0.37	1.1	0.66	0.8	13
cis 1,2-Dichloroethene	µg/L	70	NA	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	0.41	0.36	0.41	0.36	0.44	0.50	ND(1.0)	0.45	0.52	ND(1.0)	0.95	0.41	0.38	0.40	0.47	ND(1.0)	0.50	0.36	0.37	0.31	0.26	0.19	0.47
Trichloroethene	µg/L	5	NA	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.4)
Vinyl Chloride	µg/L	2	NA	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.5)	ND(0.8)	ND(0.4)	ND(0.4)	ND(0.4)
AP-5589	Zone:	Intermediate		Location:	Downgradient																														
1,1,2,2-Tetrachloroethane	µg/L	5.2	ND(1.0)	ND(1.0)	2.00	1.16	ND(1.0)	ND(1.0)	ND(1.0)	1.30	ND(5.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	0.40	2.08	0.67	8.42	6.34	5.60	24.5	ND(0.5)	0.23	0.22	0.63	5.6	4.9	ND(1.0)	ND(1.0)	ND(1.0)	0.31	ND(0.4)	ND(0.4)	1.5
1,1,2-Trichloroethane	µg/L	5	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(2.0)	ND(2.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	0.094	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)
Benzene	µg/L	5	4.00	4.03	4.00	4.01	4.28	3.87	3.86	4.10	4.10	3.54	3.32	3.47	4.25	3.95	3.38	3.58	3.43	3.98	3.40	3.20	2.54	3.30	3.60	3.00	3.40	2.80	3.50	3.3	3.1	2.6	3.0	2.4	3.3
bis(2-Ethylhexylphthalate)	µg/L	6	1.00	ND(11)	9.3	NA	ND(11)	ND(10)	ND(10)	2.80	ND(5.0)	ND(20)	ND(20)	R	ND(16)	ND(9.3)	ND(10)	ND(10)	ND(10)	ND(10)	ND(16)	ND(10.4)	ND(10.7)	4.00	ND(15)	ND(15)	ND(9.6)	ND(9.6)	1.6	0.79	ND(5.2)	0.97	23	ND(0.2)	ND(0.3)
cis 1,2-Dichloroethene	µg/L	70	13.0	9.83	9.00	10.7	11.1	9.44	8.58	9.00	14.0	7.37	8.19	8.39	9.28	10.2	11.0	10.9	10.5	12.0	14.0	11.1	13.4	14.0	15.0	13.0	14.0	13.0	17	18	19	16	16	14	16
Trichloroethene	µg/L	5	4.00	3.47	4.00	3.73	3.96	3.74	3.52	3.90	4.50	3.05	3.49	3.01	3.19	3.42	3.95	3.01	3.33	3.84	3.90	5.04	3.83	3.10	3.80	3.90	5.10	4.10	4.90	4.4	4.4	4.5	4.5	3.6	4.9
Vinyl Chloride	µg/L	2	ND(1.0)	1.19	ND(1.0)	1.24	1.44	1.50	1.40	1.70	2.60	ND(1.0)	1.41	1.33	1.07	1.64	2.10	1.39	1.55	2.64	1.20	1.32	1.61	1.10	1.10	ND(1.0)	1.00	ND(1.0)	0.97	1.2	0.85	0.66	0.60	0.71	0.88
AP-6136	Zone:	Intermediate		Location:	Downgradient																														
1,1,2,2-Tetrachloroethane	µg/L	5.2	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(2.0)	ND(2.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.5)	ND(0.5)	ND(0.5)	0.55	ND(0.5)	ND(1.0)	ND(0.5)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)
1,1,2-Trichloroethane	µg/L	5	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(2.0)	ND(2.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.2)	ND(0.4)
Benzene	µg/L	5	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(2.0)	ND(2.0)	ND(0.5)	0.42	0.28	0.26	0.34	0.43	ND(0.4)	ND(0.4)	0.35	0.32	0.26	ND(0.4)	0.19	0.27	0.43	0.35	0.29	0.35	ND(1.0)	0.29	0.21	0.16	0.21	0.53
bis(2-Ethylhexylphthalate)	µg/L	6	22.0	24.8	13.0	NA	32.3	36.8	ND(10)	33.0	ND(0.5)	ND(22)	ND(22)	5.30	ND(17)	4.20	13.0	8.90	ND(10)	ND(9.9)	0.43	ND(10.5)	ND(10.9)	2.40	ND(15)	ND(15)	1.2	2.6	2.6	0.32	0.32	1.1	NA	0.96	6.8
cis 1,2-Dichloroethene	µg/L	70	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(2.0)	ND(2.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	0.091	0.10	ND(1.0)	0.11	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.4)
Trichloroethene	µg/L	5	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(2.0)	ND(2.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)
Vinyl Chloride	µg/L	2	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(2.0)	ND(2.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.5)	ND(0.8)	ND(0.4)	ND(0.4)	ND(0.4)
AP-6138	Zone:	Intermediate		Location:	Downgradient																														
1,1,2,2-Tetrachloroethane	µg/L	5.2	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	NS	ND(2.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(1.0)	ND(0.5)	0.95	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	1.5	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	0.75
1,1,2-Trichloroethane	µg/L	5	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	NS	ND(2.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)
Benzene	µg/L	5	3.00	3.07	3.00	3.28	2.83	3.53	2.82	NS	2.00	3.29	2.86	3.15	3.04	4.14	4.24	3.90	3.66	3.80	3.70	3.71	2.22	3.10	3.30	2.90	3.30	3.40	4.70	2.9	3.0	2.8	2.8	2.23	2.5
bis(2-Ethylhexylphthalate)	µg/L	6	1.00	35.5	3.10	NA	19.1	ND(10)	ND(10)	NS	ND(5.3)	ND(22)	ND(22)	5.6	ND(16)	ND(9.4)	ND(10)	ND(11)	ND(11)	ND(10)	11.0	ND(11.5)	ND(10.8)	2.10	ND(15)	ND(15)	ND(9.6)	ND(9.6)	2.4	ND(4.8)	0.67	0.82	0.76	ND(0.2)	ND(2.9)
cis 1,2-Dichloroethene	µg/L	70	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	NS	ND(2.0)	ND(0.5)	0.36	ND(1.0)	0.59	0.45	0.44	0.57	ND(1.0)	0.34	0.36	ND(1.0)	0.96	0.36	0.41	0.24	0.44	0.55	0.52	0.37	0.36	0.39	0.39	0.25	0.38

OU4 - Landfill
Groundwater Monitoring Results

Well/Constituent	Unit	Cleanup Goal	Jul-97	Dec-98	Mar-99	Jun-99	Aug-99	Mar-00	Aug-00	Mar-01	Sep-01	Jun-02	Oct-02	May-03	Sep-03	Jun-04	Oct/Nov-04	May-05	Oct-05	Jun-06	Oct-06	May-07	Oct-07	May-08	Sep-08	Jun-09	Nov-09	May-10	Oct-10	Jul-11	Oct-11	Nov-12	Jun-13	Sep-13	Oct-14
Trichloroethene	µg/L	5	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	NS	ND(2.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	0.47	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	0.42	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	0.33	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.4)
Vinyl Chloride	µg/L	2	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	NS	ND(2.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.5)	ND(0.8)	ND(0.4)	ND(0.4)	ND(0.4)
AP-6530	Zone:	Deep		Location:	Downgradient																														
1,1,2,2-Tetrachloroethane	µg/L	5.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	0.89
1,1,2-Trichloroethane	µg/L	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)
Benzene	µg/L	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.69	5.7	4.2	2.5	5.8	5.0	3.2
bis(2-Ethylhexylphthalate)	µg/L	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND(52)	0.43	0.50	1.1	1.3	1.1	27
cis 1,2-Dichloroethene	µg/L	70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND(1.0)	1.6	0.90	0.54	1.8	1.6	0.42
Trichloroethene	µg/L	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND(1.0)	ND(1.0)	ND(1.0)	ND(2)	ND(0.2)	ND(0.2)	ND(0.4)
Vinyl Chloride	µg/L	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND(1.0)	ND(1.5)	ND(1.5)	ND(0.8)	0.31	0.27	ND(0.4)
AP-6532	Zone:	Deep		Location:	Downgradient																														
1,1,2,2-Tetrachloroethane	µg/L	5.2	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(1.0)	ND(0.5)	ND(0.5)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)
1,1,2-Trichloroethane	µg/L	5	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)
Benzene	µg/L	5	2.00	1.79	2.00	1.77	1.52	1.81	1.80	2.40	2.00	1.64	2.17	1.75	2.00	8.09	0.86	8.43	8.30	9.62	8.80	9.35	7.96	9.60	10.0	3.40	1.00	11.0	12.0	11.0	10.0	2.4	11.0	9.2	13
bis(2-Ethylhexylphthalate)	µg/L	6	6.00	ND(12)	8.90	NA	29.1	75.0	ND(10)	ND(5.1)	ND(5.7)	ND(22)	ND(23)	6.80	ND(17)	ND(10)	ND(10)	ND(10)	ND(10)	ND(9.6)	0.47	ND(11.2)	ND(10.6)	0.82	ND(15)	ND(15)	7.8	ND(9.6)	1.4	0.74	0.33	1.2	1.1	1.6	ND(2.9)
cis 1,2-Dichloroethene	µg/L	70	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	3.82	ND(1.0)	3.82	3.74	3.74	4.10	3.21	2.74	3.30	3.70	11.0	0.62	3.4	3.4	3.3	2.8	0.66	2.3	2.4	2.4
Trichloroethene	µg/L	5	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	0.95	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.4)
Vinyl Chloride	µg/L	2	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	0.31	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.5)	ND(1.5)	ND(0.8)	ND(0.4)	ND(0.4)	ND(0.4)
AP-6535	Zone:	Deep		Location:	Downgradient																														
1,1,2,2-Tetrachloroethane	µg/L	5.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND(1.0)	ND(1.0)	NS	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)
1,1,2-Trichloroethane	µg/L	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND(1.0)	ND(1.0)	NS	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)
Benzene	µg/L	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.6	3.4	NS	3.1	3.3	2.1	3.3
bis(2-Ethylhexylphthalate)	µg/L	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.4	0.49	NS	1.6	1.1	0.95	2.3
cis 1,2-Dichloroethene	µg/L	70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	33	34	NS	31	33	22	34
Trichloroethene	µg/L	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.65	0.57	NS	0.58	0.95	0.33	0.73
Vinyl Chloride	µg/L	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.9	1.1	NS	1.0	0.86	0.66	1.1
AP-8063	Zone:	Deep		Location:	Downgradient																														
1,1,2,2-Tetrachloroethane	µg/L	5.2	NA	NA	NA	NA	NA	NA	NA	NA	51.0	NS	49.6	33.6	77.4	9.60	0.94	11.3	1.59	3.06	1.60	1.26	2.95	11.0	11.0	20.0	0.99	29.0	37.0	61	49	43	46	43	39
1,1,2-Trichloroethane	µg/L	5	NA	NA	NA	NA	NA	NA	NA	NA	0.85	NS	0.84	0.64	0.97	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	0.36	0.50	0.28	ND(1.0)	0.66	0.83	0.89	0.94	0.92	0.95	1.0	0.79
Benzene	µg/L	5	NA	NA	NA	NA	NA	NA	NA	NA	4.50	NS	3.39	3.44	3.46	3.01	0.73	2.65	3.46	3.56	2.80	2.92	2.65	2.60	2.90	2.30	0.15	2.80	3.0	2.6	2.7	2.5	2.5	2.0	2.6
bis(2-Ethylhexylphthalate)	µg/L	6	NA	NA	NA	NA	NA	NA	NA	NA	ND(5.3)	NS	ND(20)	41.0	ND(16)	ND(10)	ND(10)	ND(10)	11.0	7.4	ND(17)	ND(10.5)	ND(10.9)	0.39	ND(15)	ND(15)	3.8	1.1	ND(5.2)	0.77	15	1.2	2.0	2.5	ND(2.9)
cis 1,2-Dichloroethene	µg/L	70	NA	NA	NA	NA	NA	NA	NA	NA	72.0	NS	43.5	74.8	70.5	69.6	5.10	46.6	87.7	82.5	82.0	58.8	57.1	94.0	91.0	75.0	6.00	110	110	87	91	110	93	83	120
Trichloroethene	µg/L	5	NA	NA	NA	NA	NA	NA	NA	NA	24.0	NS	16.5	22.5	28.2	17.3	1.23	16.7	21.6	22.9	18.0	22.0	21.0	17.0	16.0	15.0	1.10	21.0	24.0	23.0	24.0	26.0	25.0	21.0	29
Vinyl Chloride	µg/L	2	NA	NA	NA	NA	NA	NA	NA	NA	2.10	NS	1.10	1.48	1.91	1.58	ND(1.0)	1.30	1.64	2.22	ND(10)	1.76	2.08	1.50	1.40	1.10	ND(1.0)	0.76	1.2	1.3	1.2	1.2	0.98	0.82	1.3

Notes:
- NA not analyzed
- ND not detected (detection limit in brackets)
- NS not sampled
- R result rejected
- µg/L = micrograms per liter
- result exceeds cleanup goal

Summary of Mann-Kendall Test Results [1,2]

Well	Constituent	Sample size (n)	Test Statistic (S)	Critical Value ($Z_{0.90}$) or Test Probability (ρ)	Conclusion	Notes
AP-5588						**Shallow zone downgradient well**
	1,1,2,2-tetrachloroethane	32	-72	-1.16	No trend	All results above the SCL
	1,1,2-trichloroethane	32	-79	-1.26	No trend	19 of 32 results above the SCL
	trichloroethene	32	-90	-1.46	Downward trend	All results above the SCL
	cis 1,2-dichloroethene	32	-149	-2.41	Downward trend	31 of 32 results above the SCL
	vinyl chloride	28	-28	-0.55	No trend	1 of 32 results above the SCL
	benzene	30	-103	-1.86	Downward trend	All results below the SCL
	bis(2-ethylhexyl)phthalate	31		Not evaluated		2 of 31 results above the SCL, 22 results ND
AP-8061						**Shallow zone downgradient well**
	1,1,2,2-tetrachloroethane	25		Not evaluated		All results below the SCL, 17 of 25 results ND
	1,1,2-trichloroethane	25		Not evaluated		All results ND
	trichloroethene	25	-187	-4.41	Downward trend	21 of 25 results above the SCL
	cis 1,2-dichloroethene	25	-202	-4.72	Downward trend	All results below the SCL
	vinyl chloride	25		Not evaluated		All results below the SCL, 10 of 25 results ND
	benzene	25	-31	-0.71	No trend	12 of 25 results above the SCL
	bis(2-ethylhexyl)phthalate	25		Not evaluated		1 of 25 results above the SCL, 17 of 25 results ND
AP-10257						**Shallow zone upgradient well**
	1,1,2,2-tetrachloroethane	4		Not evaluated		All results ND
	1,1,2-trichloroethane	4		Not evaluated		All results ND
	trichloroethene	4		Not evaluated		All results ND
	cis 1,2-dichloroethene	4		Not evaluated		All results below the SCL
	vinyl chloride	4		Not evaluated		All results ND
	benzene	4		Not evaluated		3 of 4 results above the SCL
	bis(2-ethylhexyl)phthalate	4		Not evaluated		All results below the SCL, 1 of 4 results ND
AP-10258						**Shallow zone upgradient well**
	1,1,2,2-tetrachloroethane	4		Not evaluated		All results ND
	1,1,2-trichloroethane	4		Not evaluated		All results ND
	trichloroethene	4		Not evaluated		All results ND
	cis 1,2-dichloroethene	4		Not evaluated		All results below the SCL
	vinyl chloride	4		Not evaluated		All results ND
	benzene	4		Not evaluated		1 of 4 results above the SCL, 1 result ND
	bis(2-ethylhexyl)phthalate	4		Not evaluated		All results below the SCL, 2 of 4 results ND
AP-10259						**Shallow zone upgradient well**
	1,1,2,2-tetrachloroethane	4		Not evaluated		All results ND
	1,1,2-trichloroethane	4		Not evaluated		All results ND
	trichloroethene	4		Not evaluated		All results ND
	cis 1,2-dichloroethene	4		Not evaluated		All results below the SCL, 2 of 4 results ND
	vinyl chloride	4		Not evaluated		All results ND
	benzene	4		Not evaluated		All results below the SCL, 1 of 4 results ND
	bis(2-ethylhexyl)phthalate	4		Not evaluated		All results below the SCL, 2 of 4 results ND
FWLF-4						**Shallow zone upgradient well**
	1,1,2,2-tetrachloroethane	32		Not evaluated		All results ND
	1,1,2-trichloroethane	32		Not evaluated		All results ND
	trichloroethene	32		Not evaluated		All results ND
	cis 1,2-dichloroethene	32		Not evaluated		All results below the SCL, 12 of 32 results ND
	vinyl chloride	32		Not evaluated		All results ND
	benzene	32	-267	-4.38	Downward trend	All results below the SCL, 1 of 32 results ND
	bis(2-ethylhexyl)phthalate	31		Not evaluated		2 of 31 results above the SCL, 19 of 31 results ND
AP-5589						**Intermediate zone downgradient well**
	1,1,2,2-tetrachloroethane	32		Not evaluated		5 of 32 results above the SCL, 15 results ND
	1,1,2-trichloroethane	32		Not evaluated		All results below the SCL, 31 of 32 results ND
	trichloroethene	32	149	2.45	Upward trend	2 of 32 results above the SCL
	cis 1,2-dichloroethene	32	304	5.07	Upward trend	All results below the SCL
	vinyl chloride	32	-160	-2.63	Downward trend	3 of 32 results above the SCL, 4 results ND
	benzene	32	-294	-4.82	Downward trend	All results below the SCL
	bis(2-ethylhexyl)phthalate	30		Not evaluated		2 of 30 results above the SCL, 23 of 30 results ND
AP-6136						**Intermediate zone downgradient well**
	1,1,2,2-tetrachloroethane	32		Not evaluated		All results below the SCL, 31 of 32 results ND
	1,1,2-trichloroethane	32		Not evaluated		All results ND
	trichloroethene	32		Not evaluated		All results ND
	cis 1,2-dichloroethene	32		Not evaluated		All results below the SCL, 29 of 32 results ND
	vinyl chloride	32		Not evaluated		All results ND
	benzene	32		Not evaluated		All results below the SCL, 13 of 32 results ND
	bis(2-ethylhexyl)phthalate	30		Not evaluated		8 of 30 results above the SCL, 11 results ND
AP-6138						**Intermediate zone downgradient well**
	1,1,2,2-tetrachloroethane	31		Not evaluated		All results below the SCL, 28 of 31 results ND
	1,1,2-trichloroethane	31		Not evaluated		All results ND
	trichloroethene	31		Not evaluated		All results below the SCL, 28 of 31 results ND
	cis 1,2-dichloroethene	31		Not evaluated		All results below the SCL, 11 of 31 results ND
	vinyl chloride	31		Not evaluated		All results below the SCL, 28 of 31 results ND
	benzene	31	-97	-1.65	Downward trend	All results below the SCL
	bis(2-ethylhexyl)phthalate	31		Not evaluated		3 of 31 results above the SCL, 20 results ND

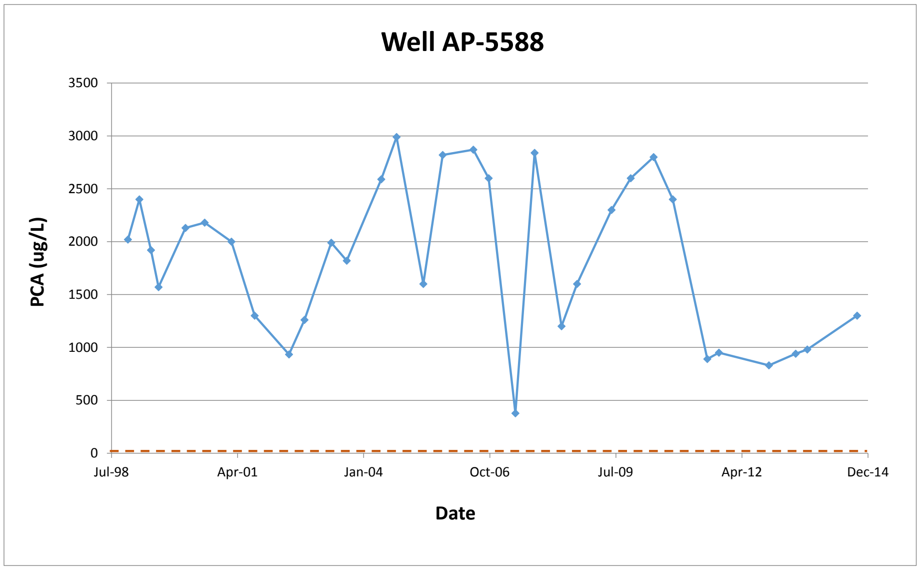
Summary of Mann-Kendall Test Results [1,2]

Well	Constituent	Sample size (n)	Test Statistic (S)	Critical Value ($Z_{0.90}$) or Test Probability (ρ)	Conclusion	Notes
AP-6530						**Deep zone downgradient well**
	1,1,2,2-tetrachloroethane	7		Not evaluated		All results below the SCL, 6 results ND
	1,1,2-trichloroethane	7		Not evaluated		All results ND
	trichloroethene	7		Not evaluated		All results ND
	cis 1,2-dichloroethene	7		Not evaluated		All results below the SCL, 1 result ND
	vinyl chloride	7		Not evaluated		All results below the SCL, 5 results ND
	benzene	7	3	0.386	No trend	3 of 7 results above the SCL
	bis(2-ethylhexyl)phthalate	7		Not evaluated		1 of 7 results above the SCL, 1 result ND
AP-6532						**Deep zone downgradient well**
	1,1,2,2-tetrachloroethane	32		Not evaluated		All results ND
	1,1,2-trichloroethane	32		Not evaluated		All results ND
	trichloroethene	32		Not evaluated		All results below the SCL, 31 of 32 results ND
	cis 1,2-dichloroethene	32		Not evaluated		All results below the SCL, 13 of 32 results ND
	vinyl chloride	32		Not evaluated		All results ND
	benzene	32	270	1.28	Upward Trend	16 of 32 results above the SCL
	bis(2-ethylhexyl)phthalate	31		Not evaluated		5 of 31 results above the SCL, 18 results ND
AP-6535						**Deep zone downgradient well**
	1,1,2,2-tetrachloroethane	6		Not evaluated		All results ND
	1,1,2-trichloroethane	6		Not evaluated		All results ND
	trichloroethene	6	1	0.500	No trend	All results below the SCL
	cis 1,2-dichloroethene	6	-1	0.500	No trend	All results below the SCL
	vinyl chloride	6	-2	0.425	No trend	All results below the SCL
	benzene	6	-8	0.104	No trend	All results below the SCL
	bis(2-ethylhexyl)phthalate	6	3	0.360	No trend	All results below the SCL
AP-8063						**Deep zone downgradient well**
	1,1,2,2-tetrachloroethane	24	44	1.07	No trend	17 of 24 results above the SCL
	1,1,2-trichloroethane	24		Not evaluated		All results below the SCL, 9 of 24 results ND
	trichloroethene	24	54	1.36	Upward trend	22 of 24 results above the SCL
	cis 1,2-dichloroethene	24	124	3.12	Upward trend	17 of 24 results above the SCL
	vinyl chloride	23	-83	-2.28	Downward trend	2 of 24 results above the SCL, 3 of 24 results ND
	benzene	24	-131	-3.36	Downward trend	All results below the SCL
	bis(2-ethylhexyl)phthalate	24		Not evaluated		4 of 24 results above the SCL, 13 results ND

Notes:

1	Mann-Kendall Test using normal approximation for large sample size (n>10); evaluated at the 90% (α=0.1) significance level
2	Mann-Kendall Test using normal approximation for small sample size (n≤10); evaluated at the 90% (α=0.1) significance level
n	sample size
ND	not detected
S	Mann-Kendall statistic
SCL	site cleanup level
Ho	null hypothesis
V(S)	variance of the Mann-Kendall statistic
$Z_{0.90}$	critical value at 90% significance level
ρ	probability, taken from Table B-10 of EM 200-1-16

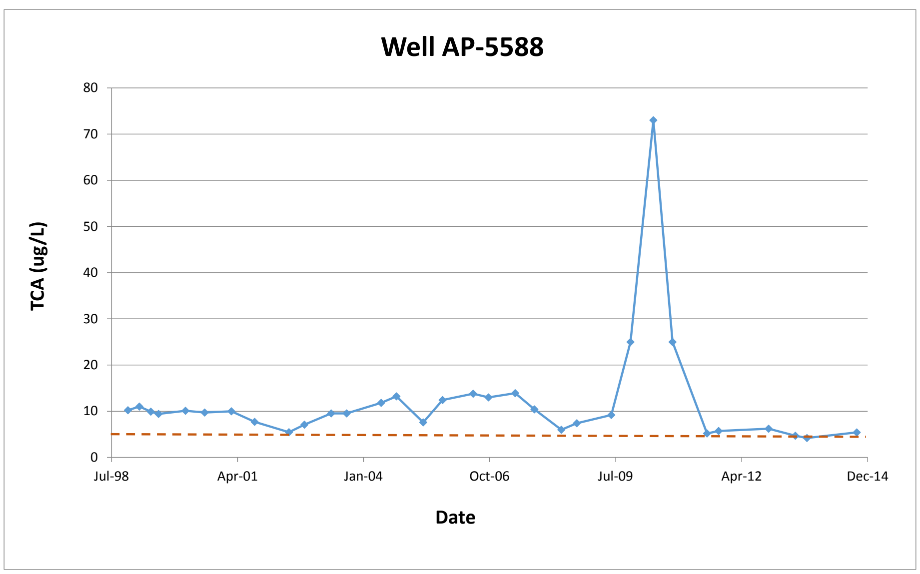
1,1,2,2-Tetrachloroethane Concentration (ug/L)



Mann-Kendall Test Using Normal Approximation for Larger Samples

n	32	
S	-72	
g	4	No. tied groups
w	2	No. data points in each tied group
V(S)	3730.667	
z	-1.162425	
-Z(0.9)	-1.28	(Table B-15, EM 200-1-16)
Ho: No trend		
Ha: Downward trend		
Reject Ho if z < Z(0.9)		Ho accepted at 90% level of confidence; no trend

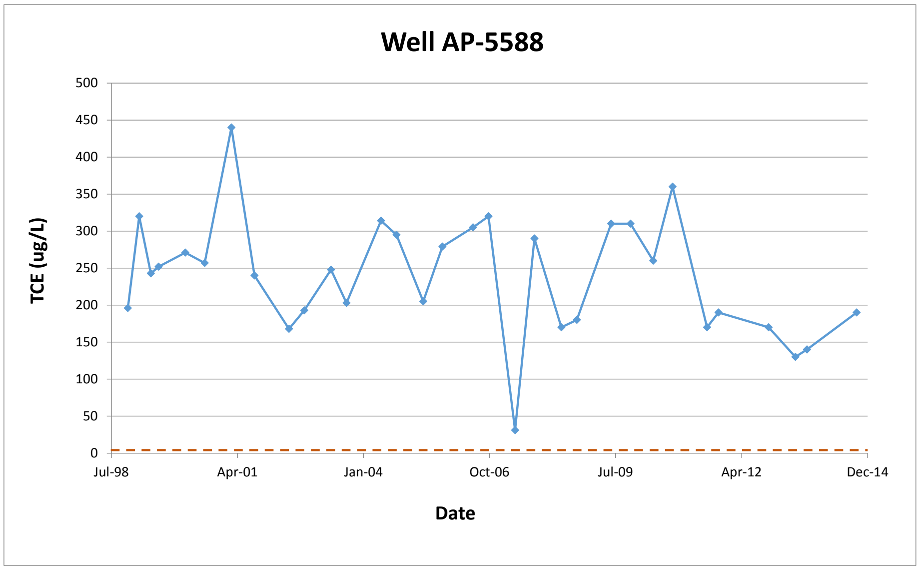
1,1,2-Trichloroethane Concentration (ug/L)



Mann-Kendall Test Using Normal Approximation for Larger Samples

n	32	
S	-79	
g	0	No. tied groups
w	2	No. data points in each tied group
V(S)	3802.667	
z	-1.264883	
-Z(0.9)	-1.28	(Table B-15, EM 200-1-16)
Ho: No trend		
Ha: Downward trend		
Reject Ho if z < Z(0.9)		Ho accepted at 90% level of confidence; no trend

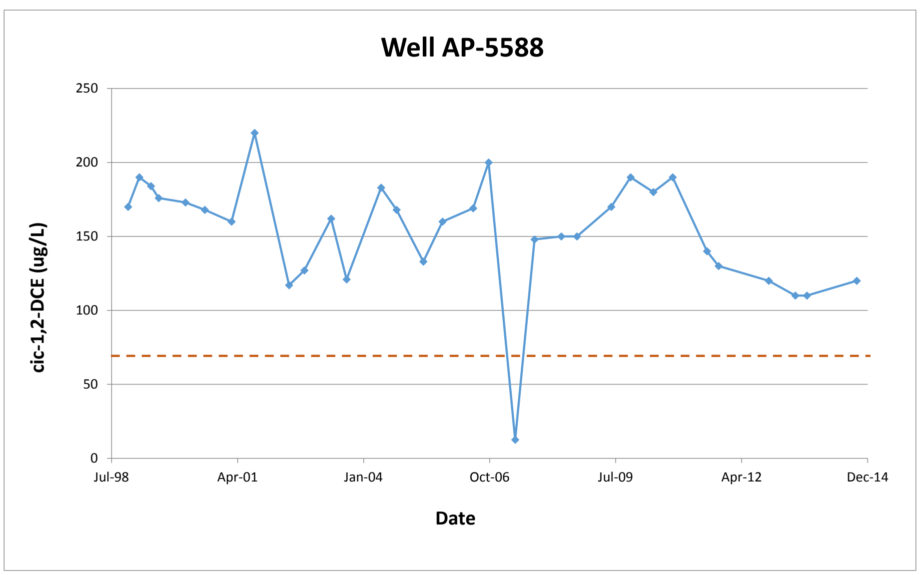
Trichloroethene Concentration (ug/L)



Mann-Kendall Test Using Normal Approximation for Larger Samples

n	32	
S	-90	
g	5	No. tied groups
w	2	No. data points in each tied group
V(S)	3712.667	
z	-1.460653	
-Z(0.9)	-1.28	(Table B-15, EM 200-1-16)
Ho: No trend		
Ha: Downward trend		
Reject Ho if z < Z(0.9)		Ho rejected at 90% level of confidence; downward trend

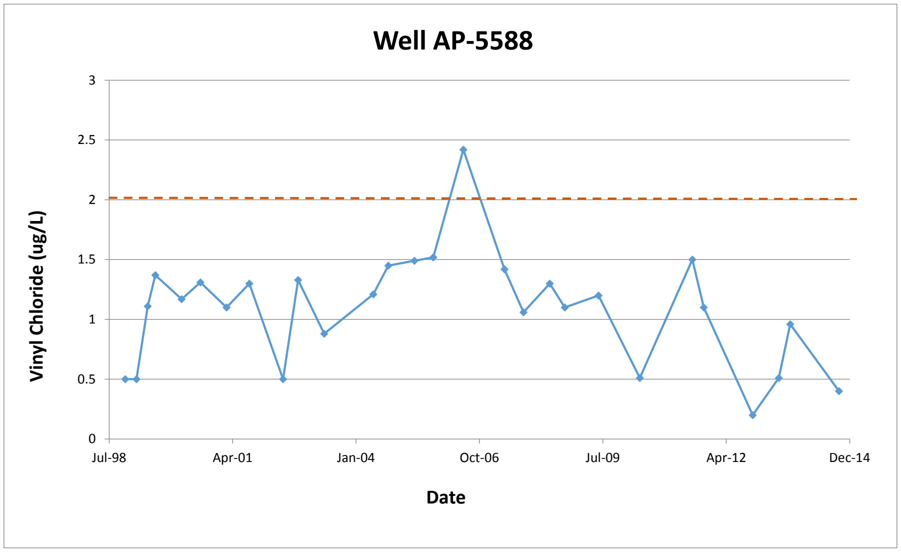
cis 1,2-Dichloroethene Concentration (ug/L)



Mann-Kendall Test Using Normal Approximation for Larger Samples

n	32	
S	-149	
g	2	No. tied groups
w	2	No. data points in each tied group
V(S)	3766.667	
z	-2.411477	
-Z(0.9)	-1.28	(Table B-15, EM 200-1-16)
Ho: No trend		
Ha: Downward trend		
Reject Ho if z < Z(0.9)		Ho rejected at 90% level of confidence; downward trend

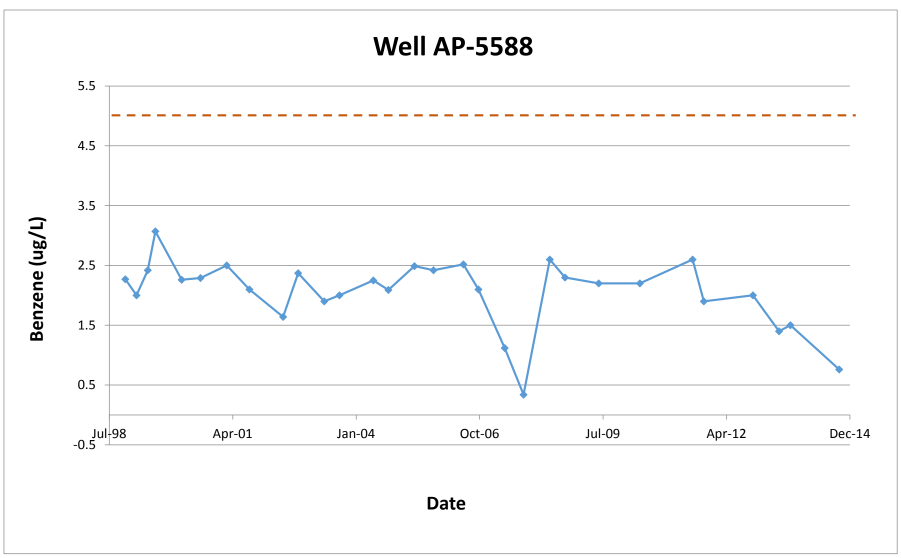
Vinyl Chloride Concentration (ug/L)



Mann-Kendall Test Using Normal Approximation for Larger Samples

n	28	
S	-28	
g	8	No. tied groups
w	2	No. data points in each tied group
V(S)	2418	
z	-0.54908	
-Z(0.9)	-1.28	(Table B-15, EM 200-1-16)
Ho: No trend		
Ha: Downward trend		
Reject Ho if z < Z(0.9)		Ho accepted at 90% level of confidence; no trend

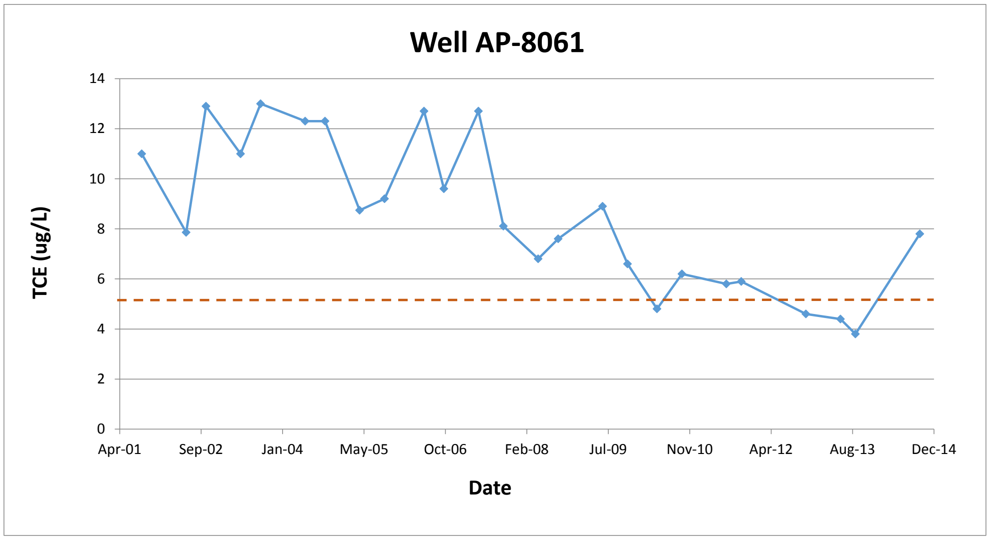
Benzene Concentration (ug/L)



Mann-Kendall Test Using Normal Approximation for Larger Samples

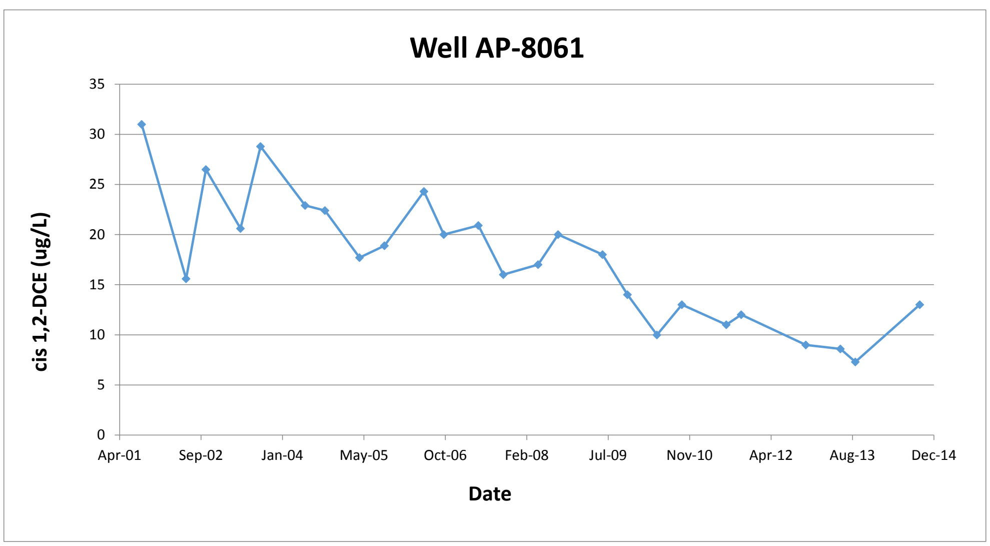
n	30	
S	-103	
g	7	No. tied groups
w	2	No. data points in each tied group
V(S)	3015.667	
z	-1.85741	
-Z(0.9)	-1.28	(Table B-15, EM 200-1-16)
Ho: No trend		
Ha: Downward trend		
Reject Ho if z < Z(0.9)		Ho rejected at 90% level of confidence; downward trend

Trichloroethene Concentration (ug/L)



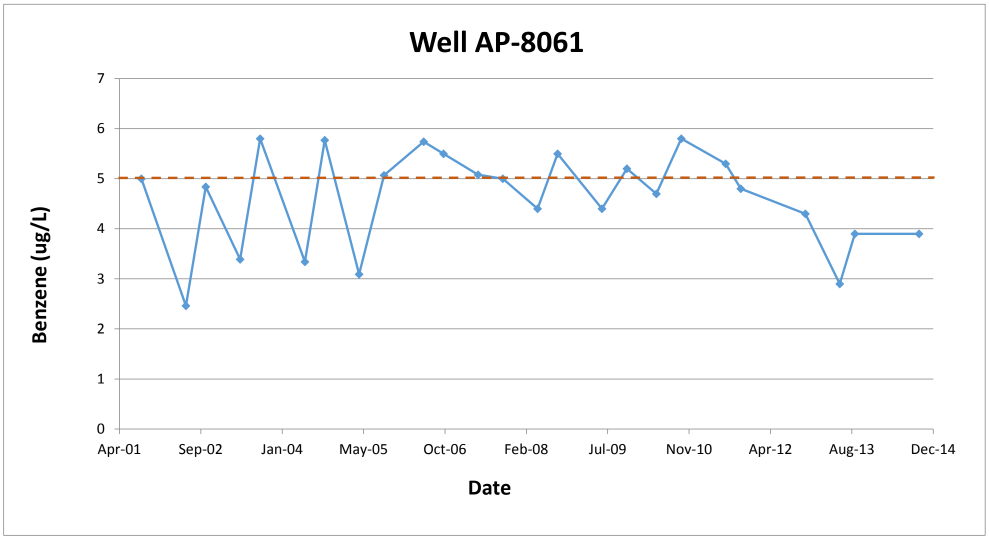
Mann-Kendall Test Using Normal Approximation for Larger Samples		
n	25	
S	-187	
g	3	No. tied groups
w	2	No. data points in each tied group
V(S)	1779.333	
z	-4.409449	
-Z(0.9)	-1.28	(Table B-15, EM 200-1-16)
Ho: No trend		
Ha: Downward trend		
Reject Ho if z < Z(0.9)		Ho rejected at 90% level of confidence; downward trend

cis 1,2-Dichloroethene Concentration (ug/L)



Mann-Kendall Test Using Normal Approximation for Larger Samples		
n	25	
S	-202	
g	1	No. tied groups
w	2	No. data points in each tied group
V(S)	1815.333	
z	-4.717565	
-Z(0.9)	-1.28	(Table B-15, EM 200-1-16)
Ho: No trend		
Ha: Downward trend		
Reject Ho if z < Z(0.9)		Ho rejected at 90% level of confidence; downward trend

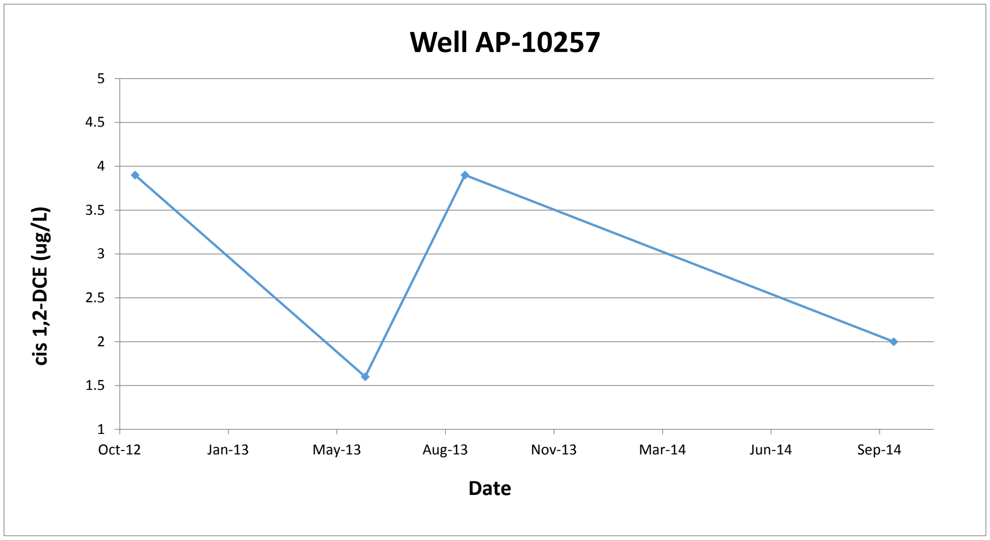
Benzene Concentration (ug/L)



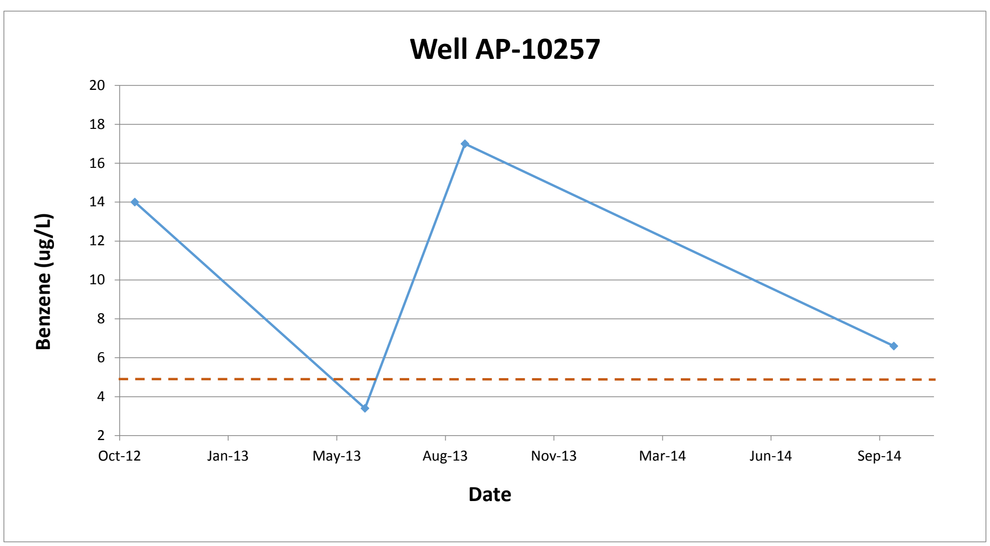
Mann-Kendall Test Using Normal Approximation for Larger Samples

n	25	
S	-31	
g	4	No. tied groups
w	2	No. data points in each tied group
V(S)	1761.333	
z	-0.714826	
-Z(0.9)	-1.28	(Table B-15, EM 200-1-16)
Ho: No trend		
Ha: Downward trend		
Reject Ho if z < Z(0.9)		Ho accepted at 90% level of confidence; no trend

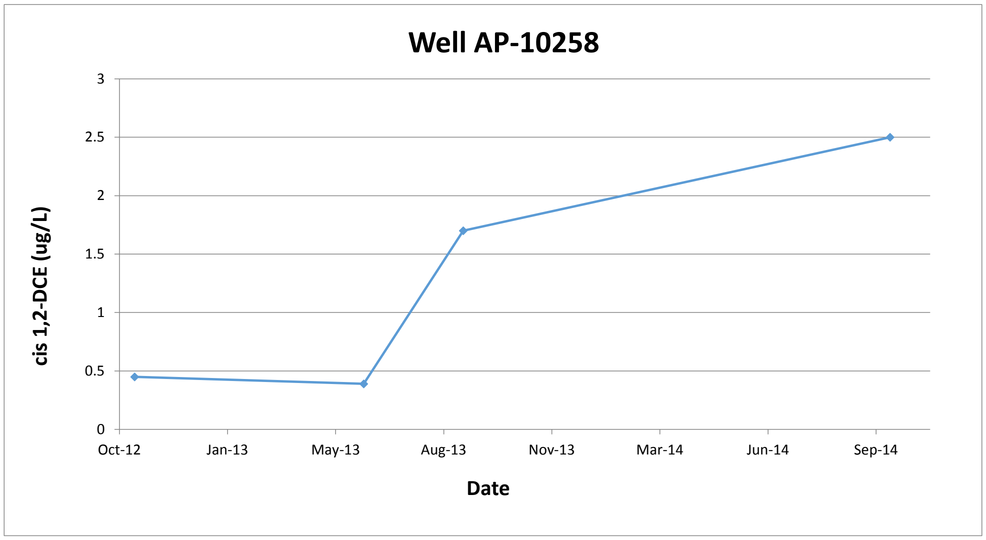
cis 1,2-Dichloroethene Concentration (ug/L)



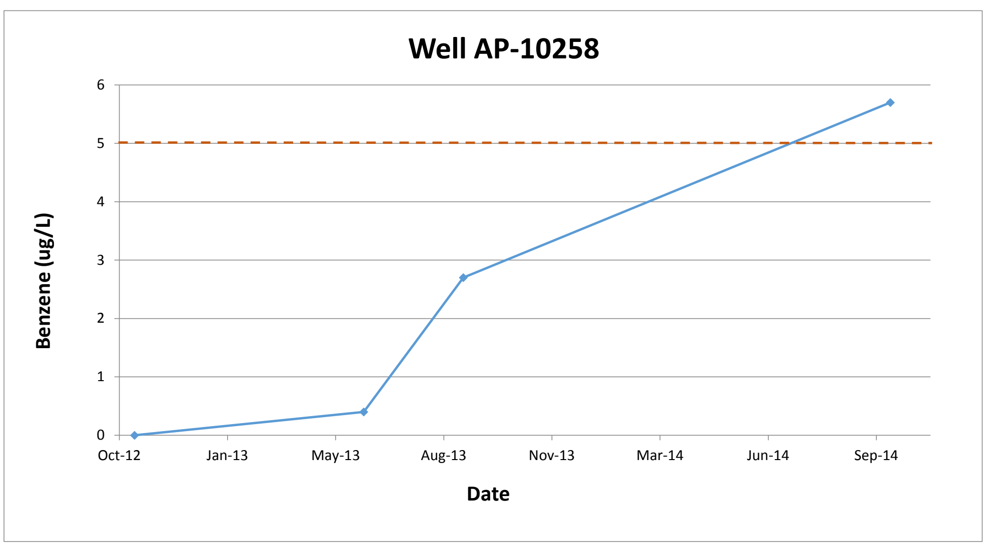
Benzene Concentration (ug/L)



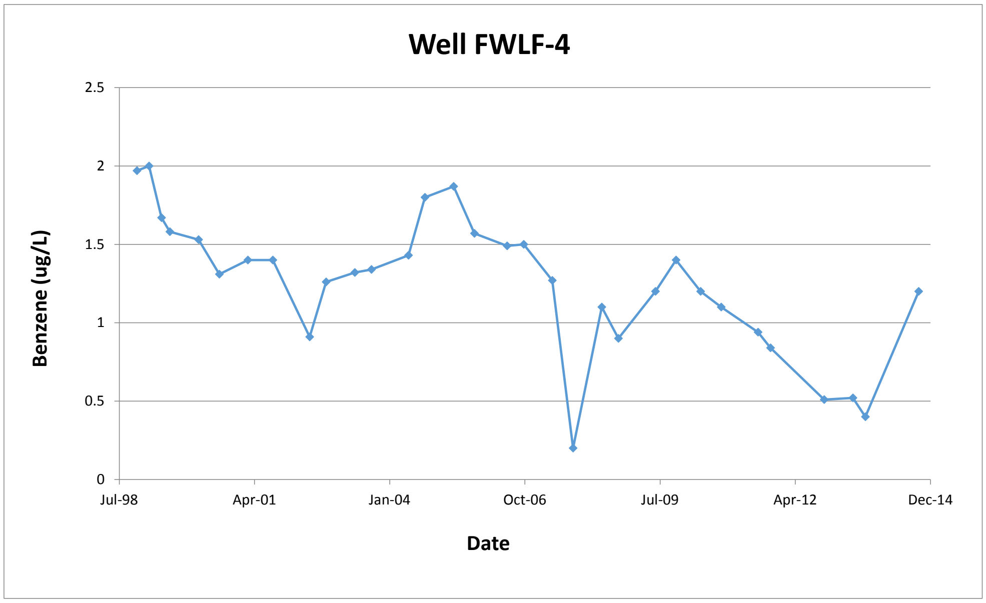
cis 1,2-Dichloroethene Concentration (ug/L)



Benzene Concentration (ug/L)



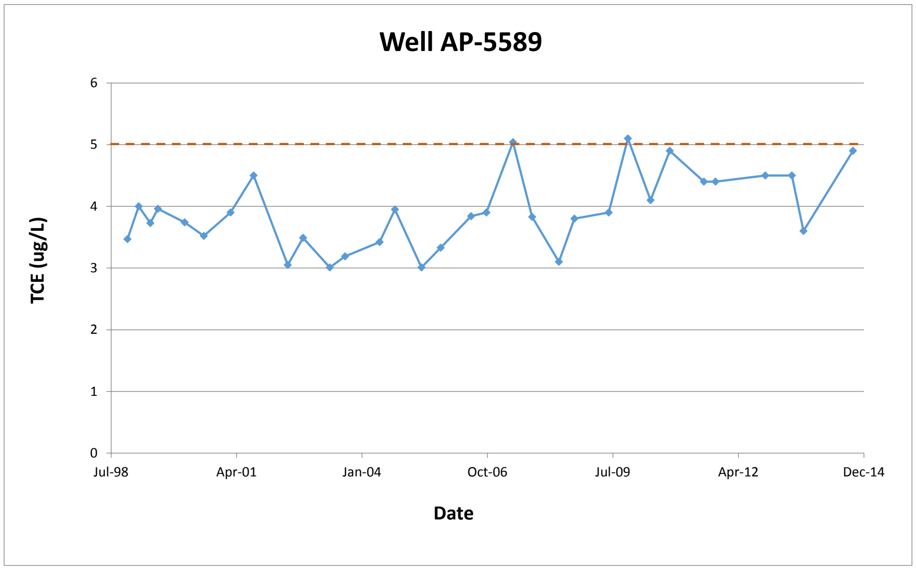
Benzene Concentration (ug/L)



Mann-Kendall Test Using Normal Approximation for Larger Samples

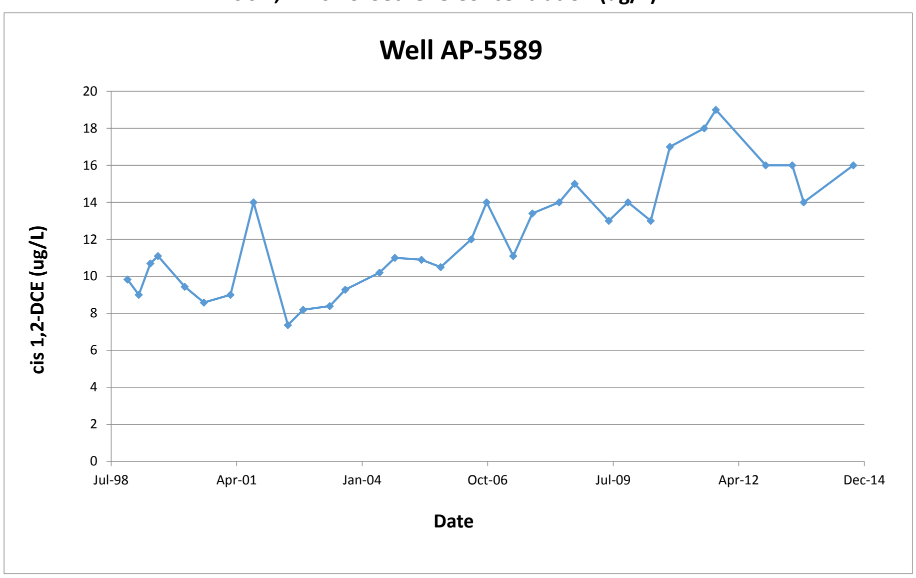
n	32	
S	-267	
g	6	No. tied groups
w	2	No. data points in each tied group
V(S)	3694.667	
z	-4.376168	
-Z(0.9)	-1.28	(Table B-15, EM 200-1-16)
Ho: No trend		
Ha: Downward trend		
Reject Ho if z < Z(0.9)		Ho rejected at 90% level of confidence; downward trend

Trichloroethene Concentration (ug/L)



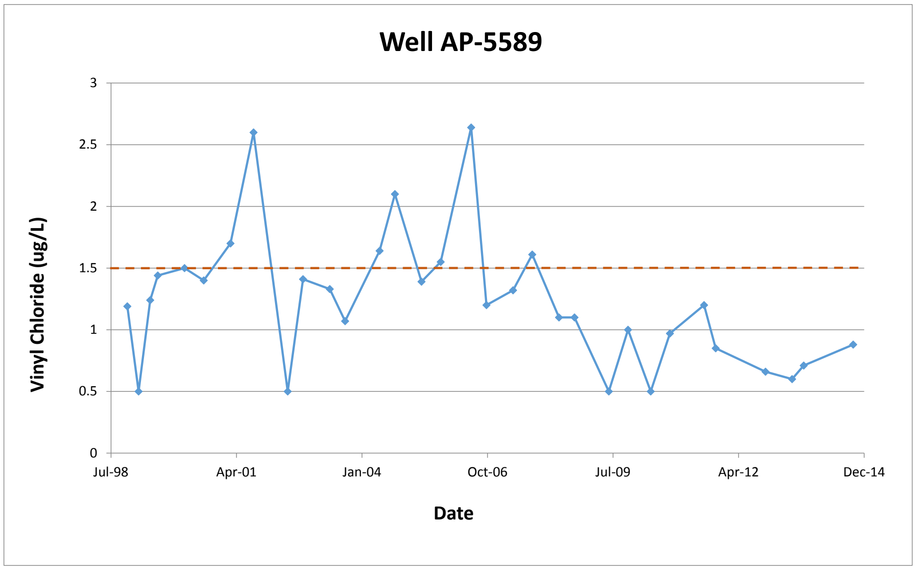
Mann-Kendall Test Using Normal Approximation for Larger Samples		
n	32	
S	149	
g	9	No. tied groups
w	2	No. data points in each tied group
V(S)	3640.667	
z	2.452852	
Z(0.9)	1.28	(Table B-15, EM 200-1-16)
Ho: No trend		
Ha: Upward trend		
Reject Ho if z > Z(0.9)		Ho rejected at 90% level of confidence; upward trend

cis 1,2-Dichloroethene Concentration (ug/L)



Mann-Kendall Test Using Normal Approximation for Larger Samples		
n	32	
S	304	
g	13	No. tied groups
w	2	No. data points in each tied group
V(S)	3568.667	
z	5.072121	
Z(0.9)	1.28	(Table B-15, EM 200-1-16)
Ho: No trend		
Ha: Upward trend		
Reject Ho if z > Z(0.9)		Ho rejected at 90% level of confidence; upward trend

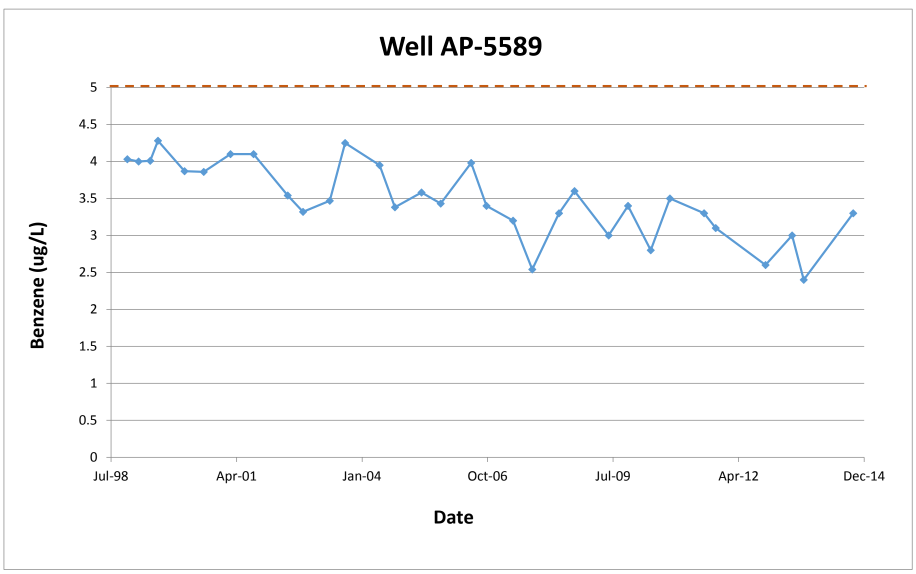
Vinyl Chloride Concentration (ug/L)



Mann-Kendall Test Using Normal Approximation for Larger Samples

n	32	
S	-160	
g	8	No. tied groups
w	2	No. data points in each tied group
V(S)	3658.667	
z	-2.628668	
-Z(0.9)	-1.28	(Table B-15, EM 200-1-16)
Ho: No trend		
Ha: Downward trend		
Reject Ho if z < Z(0.9)		Ho rejected at 90% level of confidence; downward trend

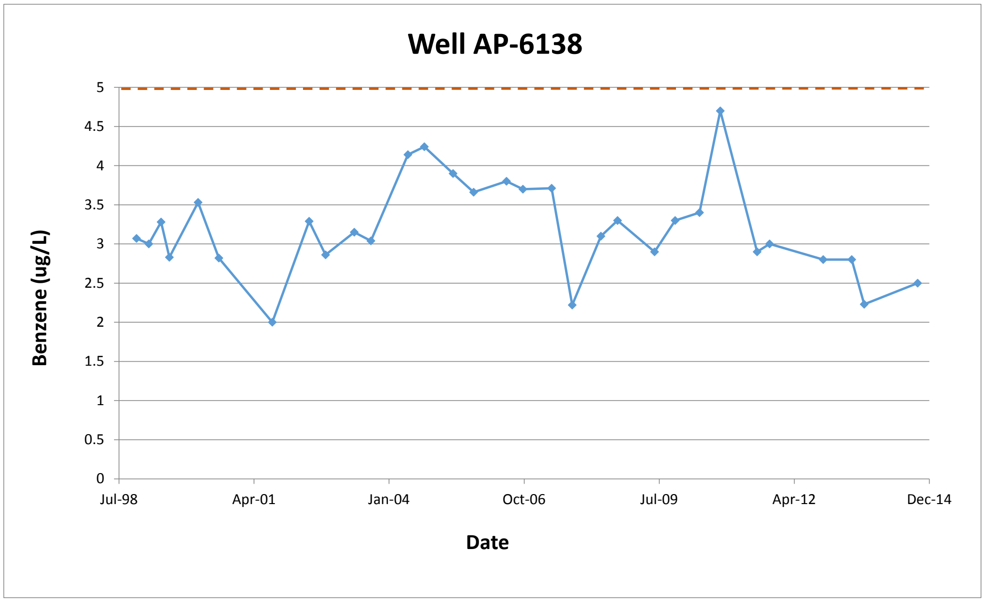
Benzene Concentration (ug/L)



Mann-Kendall Test Using Normal Approximation for Larger Samples

n	32	
S	-294	
g	6	No. tied groups
w	2	No. data points in each tied group
V(S)	3694.667	
z	-4.820366	
-Z(0.9)	-1.28	(Table B-15, EM 200-1-16)
Ho: No trend		
Ha: Downward trend		
Reject Ho if z < Z(0.9)		Ho rejected at 90% level of confidence; downward trend

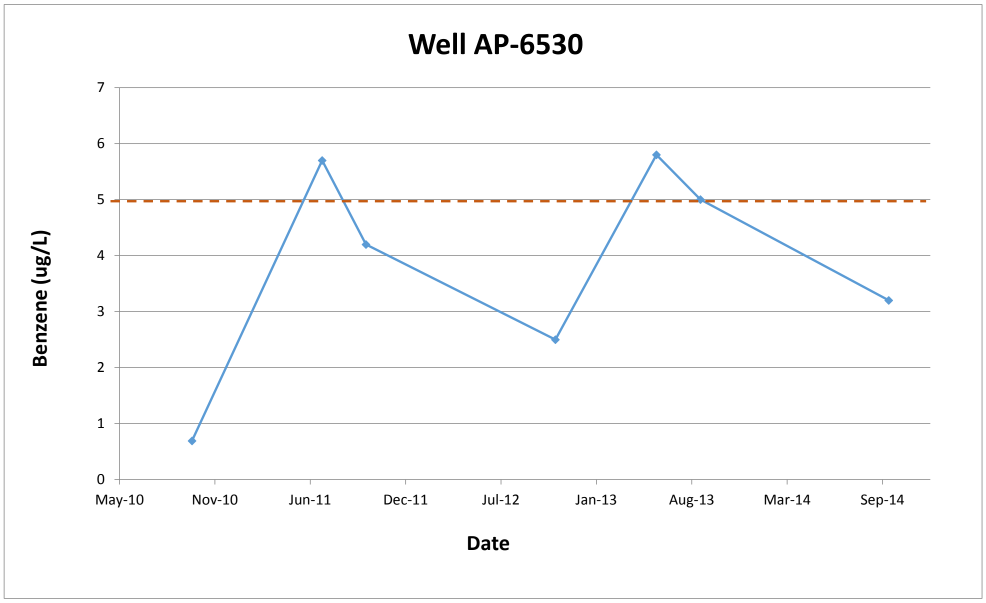
Benzene Concentration (ug/L)



Mann-Kendall Test Using Normal Approximation for Larger Samples

n	31	
S	-97	
g	4	No. tied groups
w	2	No. data points in each tied group
V(S)	3389.667	
z	-1.648894	
-Z(0.9)	-1.28	(Table B-15, EM 200-1-16)
Ho: No trend		
Ha: Downward trend		
Reject Ho if z < Z(0.9)		Ho rejected at 90% level of confidence; downward trend

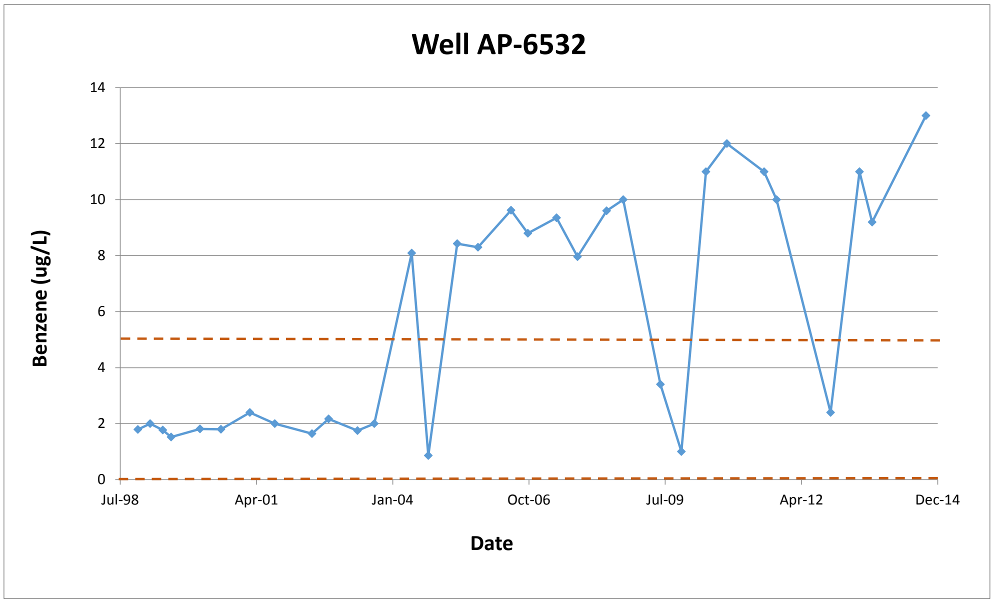
Benzene Concentration (ug/L)



Mann-Kendall Test Using Normal Approximation for Small Sample Size

n	7	
S	3	
p	0.386	Table B-10, EM 200-1-16
α	0.1	
Ho:	No trend	
Ha:	Upward trend	
	p>α	Ho rejected at 90% level of confidence, no trend

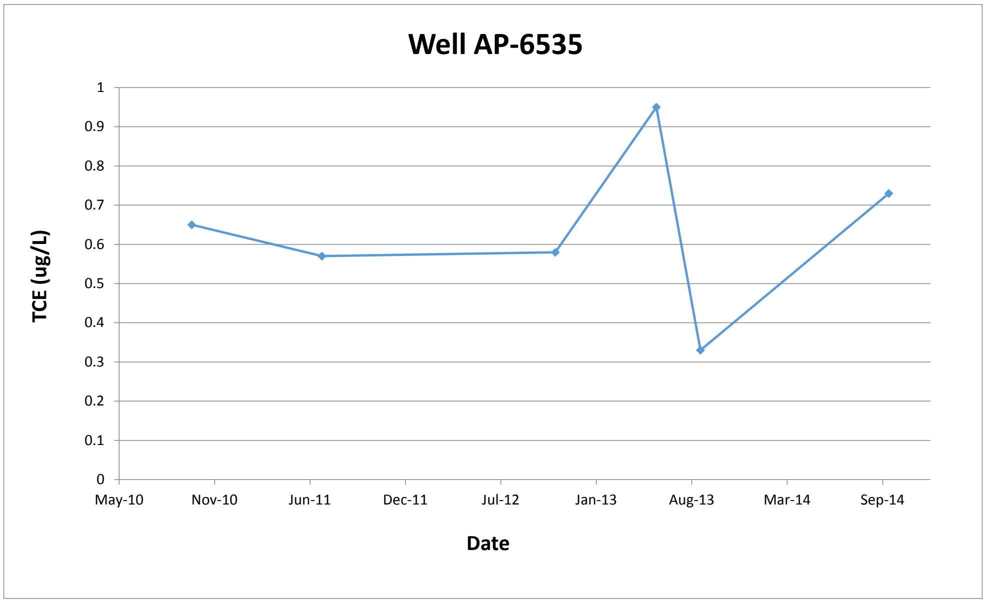
Benzene Concentration (ug/L)



Mann-Kendall Test Using Normal Approximation for Larger Samples

n	32	
S	270	
g	8	No. tied groups
w	2	No. data points in each tied group
V(S)	3658.667	
z	4.447243	
Z(0.9)	1.28	(Table B-15, EM 200-1-16)
Ho: No trend		
Ha: Upward trend		
Reject Ho if z > Z(0.9)		Ho rejected at 90% level of confidence; upward trend

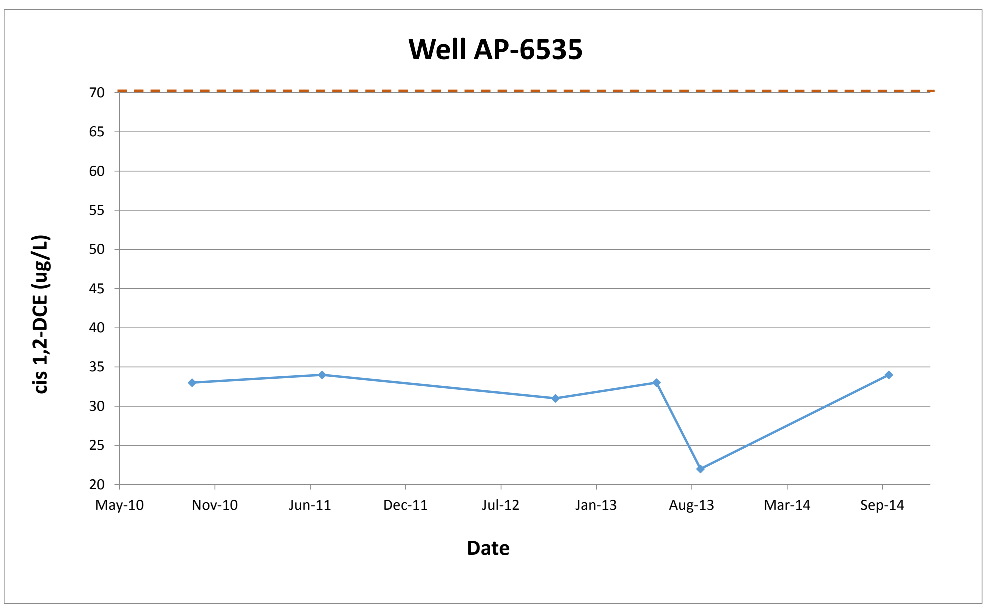
Trichloroethene Concentration (ug/L)



Mann-Kendall Test Using Normal Approximation for Small Sample Size

n	6	
S	1	
p	0.5	Table B-10, EM 200-1-16
α	0.1	
Ho:	No trend	
Ha:	Upward trend	
	p>α	Ho rejected at 90% level of confidence, no trend

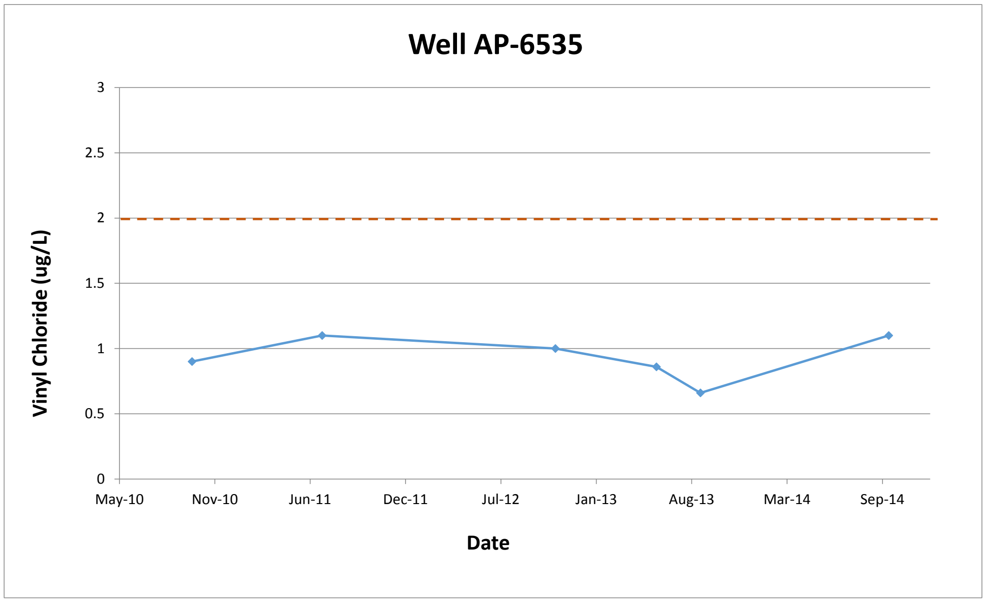
cis 1,2-Dichloroethene Concentration (ug/L)



Mann-Kendall Test Using Normal Approximation for Small Sample Size

n	6	
S	-1	
p	0.5	Table B-10, EM 200-1-16
α	0.1	
Ho:	No trend	
Ha:	Downward trend	
	p>α	Ho rejected at 90% level of confidence, no trend

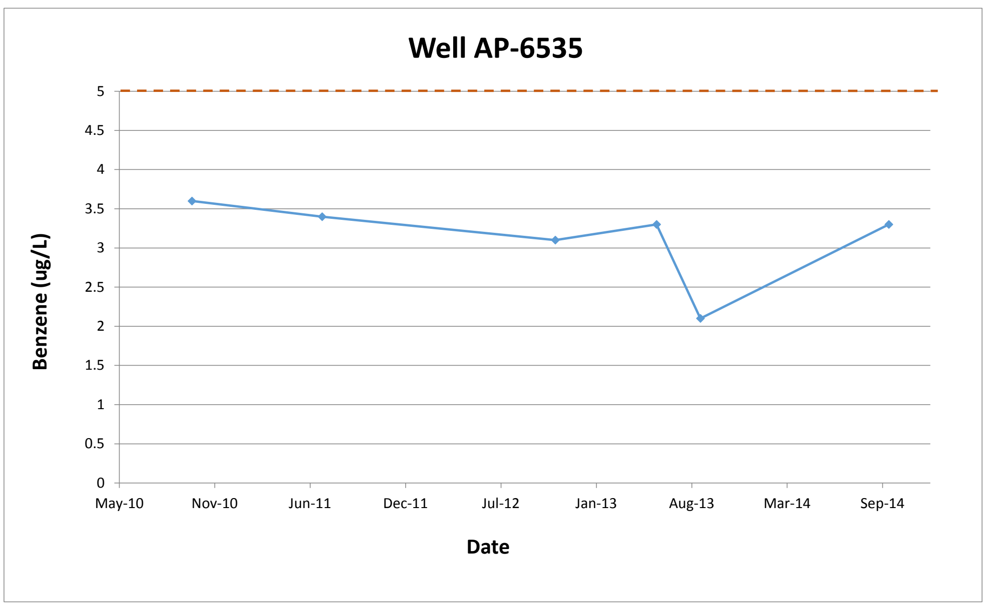
Vinyl Chloride Concentration (ug/L)



Mann-Kendall Test Using Normal Approximation for Small Sample Size

n	6	
S	-2	
p	0.425	Table B-10, EM 200-1-16
α	0.1	
Ho:	No trend	
Ha:	Downward trend	
	p>α	Ho rejected at 90% level of confidence, no trend

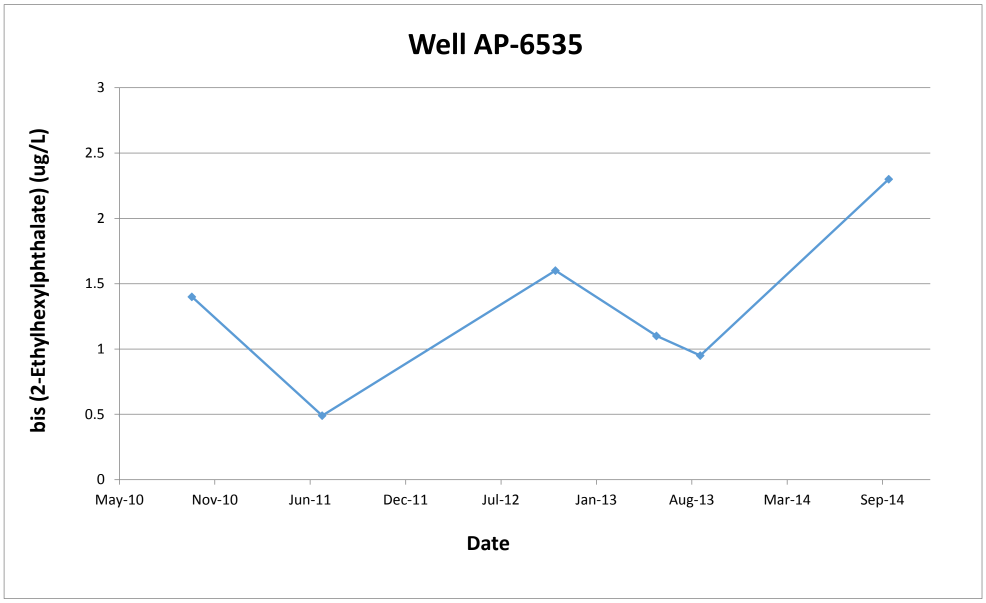
Benzene Concentration (ug/L)



Mann-Kendall Test Using Normal Approximation for Small Sample Size

n	6	
S	-8	
p	0.104	Table B-10, EM 200-1-16
α	0.1	
Ho:	No trend	
Ha:	Downward trend	
	p>α	Ho rejected at 90% level of confidence, no trend

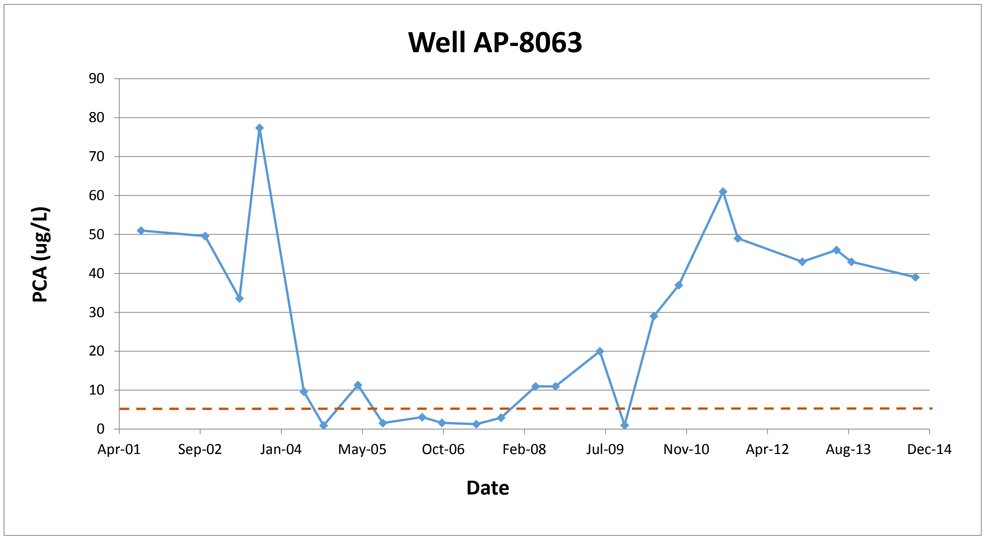
bis (2-Ethylhexylphthalate) Concentration (ug/L)



Mann-Kendall Test Using Normal Approximation for Small Sample Size

n	6	
S	3	
p	0.36	Table B-10, EM 200-1-16
α	0.1	
Ho:	No trend	
Ha:	Upward trend	
	p>α	Ho rejected at 90% level of confidence, no trend

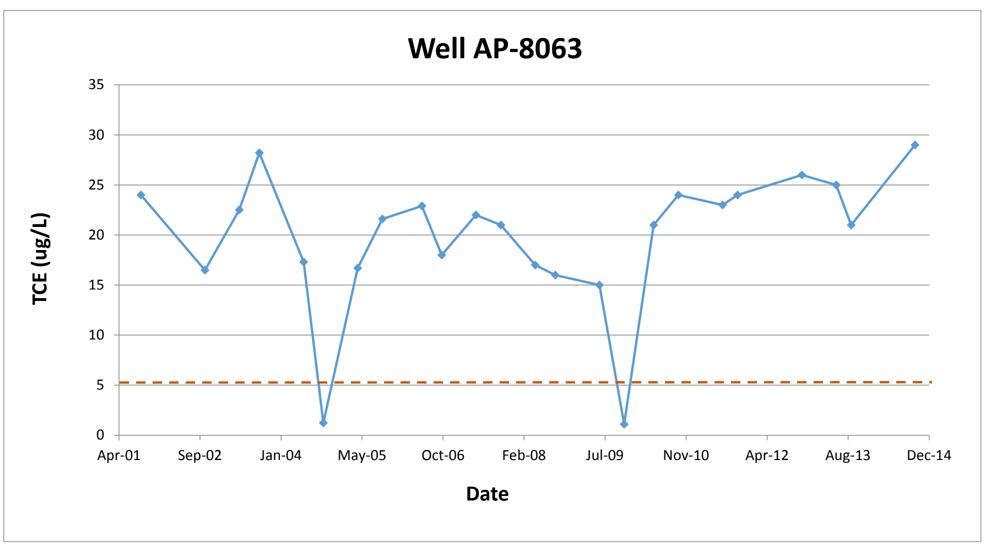
1,1,2,2-Tetrachloroethane Concentration (ug/L)



Mann-Kendall Test Using Normal Approximation for Larger Samples

n	24	
S	44	
g	1	No. tied groups
w	2	No. data points in each tied group
V(S)	1607.333	
z	1.072545	
Z(0.9)	1.28	(Table B-15, EM 200-1-16)
Ho: No trend		
Ha: Upward trend		
Reject Ho if z > Z(0.9)		Ho accepted at 90% level of confidence; no trend

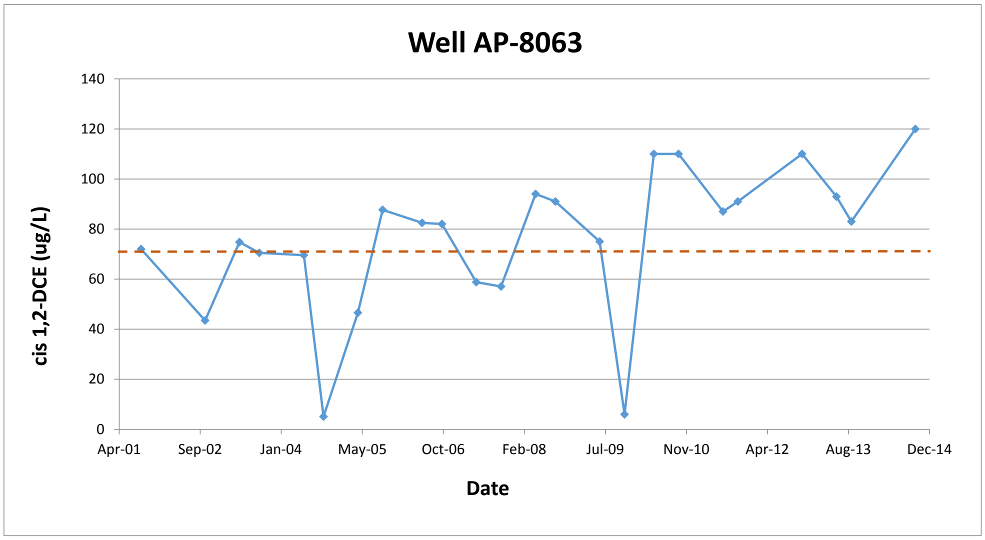
Trichloroethene Concentration (ug/L)



Mann-Kendall Test Using Normal Approximation for Larger Samples

n	24	
S	54	
g	6	No. tied groups
w	2	No. data points in each tied group
V(S)	1517.333	
z	1.360615	
Z(0.9)	1.28	(Table B-15, EM 200-1-16)
Ho: No trend		
Ha: Upward trend		
Reject Ho if z > Z(0.9)		Ho rejected at 90% level of confidence; upward trend

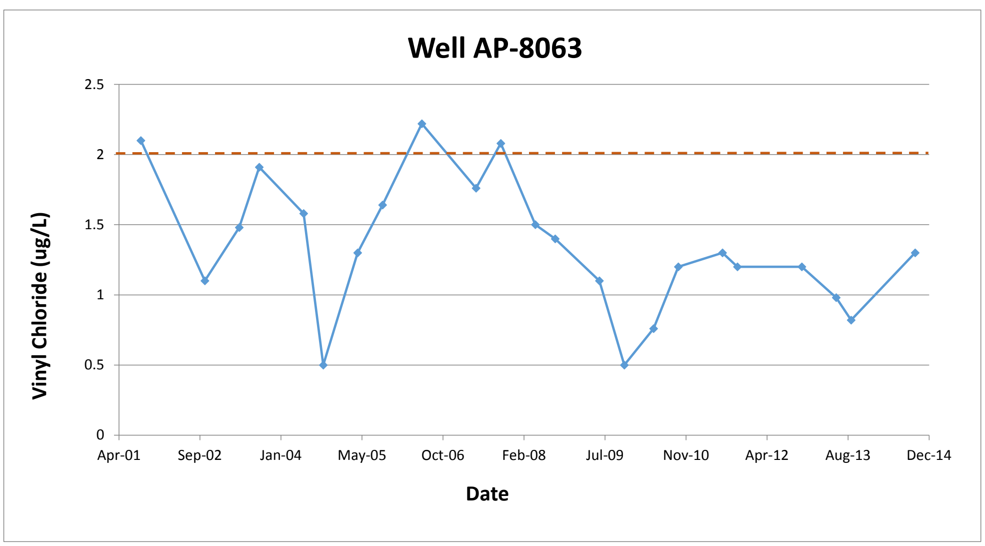
cis 1,2-Dichloroethene Concentration (ug/L)



Mann-Kendall Test Using Normal Approximation for Larger Samples

n	24	
S	124	
g	4	No. tied groups
w	2	No. data points in each tied group
V(S)	1553.333	
z	3.120849	
Z(0.9)	1.28	(Table B-15, EM 200-1-16)
Ho: No trend		
Ha: Upward trend		
Reject Ho if z > Z(0.9)		Ho rejected at 90% level of confidence; upward trend

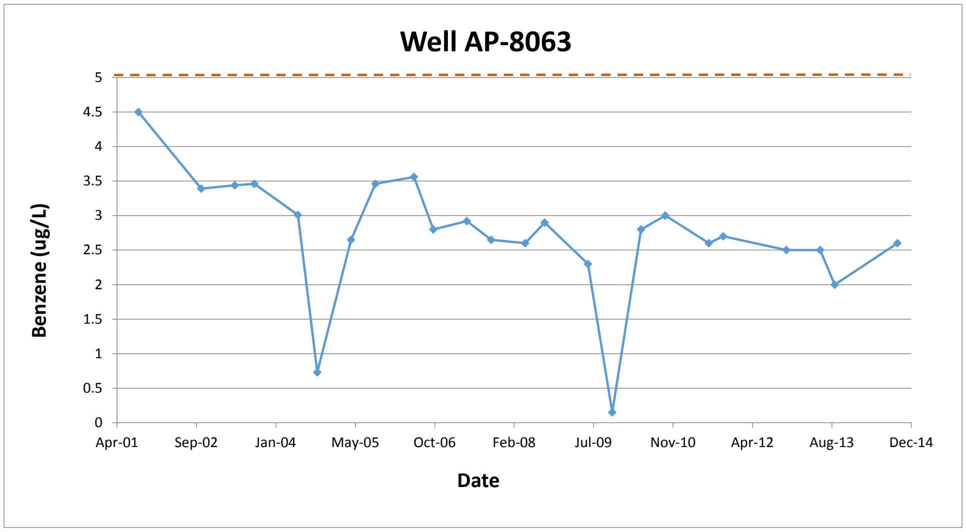
Vinyl Chloride Concentration (ug/L)



Mann-Kendall Test Using Normal Approximation for Larger Samples

n	23	
S	-83	
g	8	No. tied groups
w	2	No. data points in each tied group
V(S)	1289.667	
z	-2.283364	
-Z(0.9)	-1.28	(Table B-15, EM 200-1-16)
Ho: No trend		
Ha: Downward trend		
Reject Ho if z < Z(0.9)		Ho rejected at 90% level of confidence; downward trend

Benzene Concentration (ug/L)



Mann-Kendall Test Using Normal Approximation for Larger Samples

n	24	
S	-131	
g	7	No. tied groups
w	2	No. data points in each tied group
V(S)	1499.333	
z	-3.35733	
-Z(0.9)	-1.28	(Table B-15, EM 200-1-16)
Ho: No trend		
Ha: Downward trend		
Reject Ho if z < Z(0.9)		Ho rejected at 90% level of confidence; downward trend

OU-5 West Quartermaster's Fueling System

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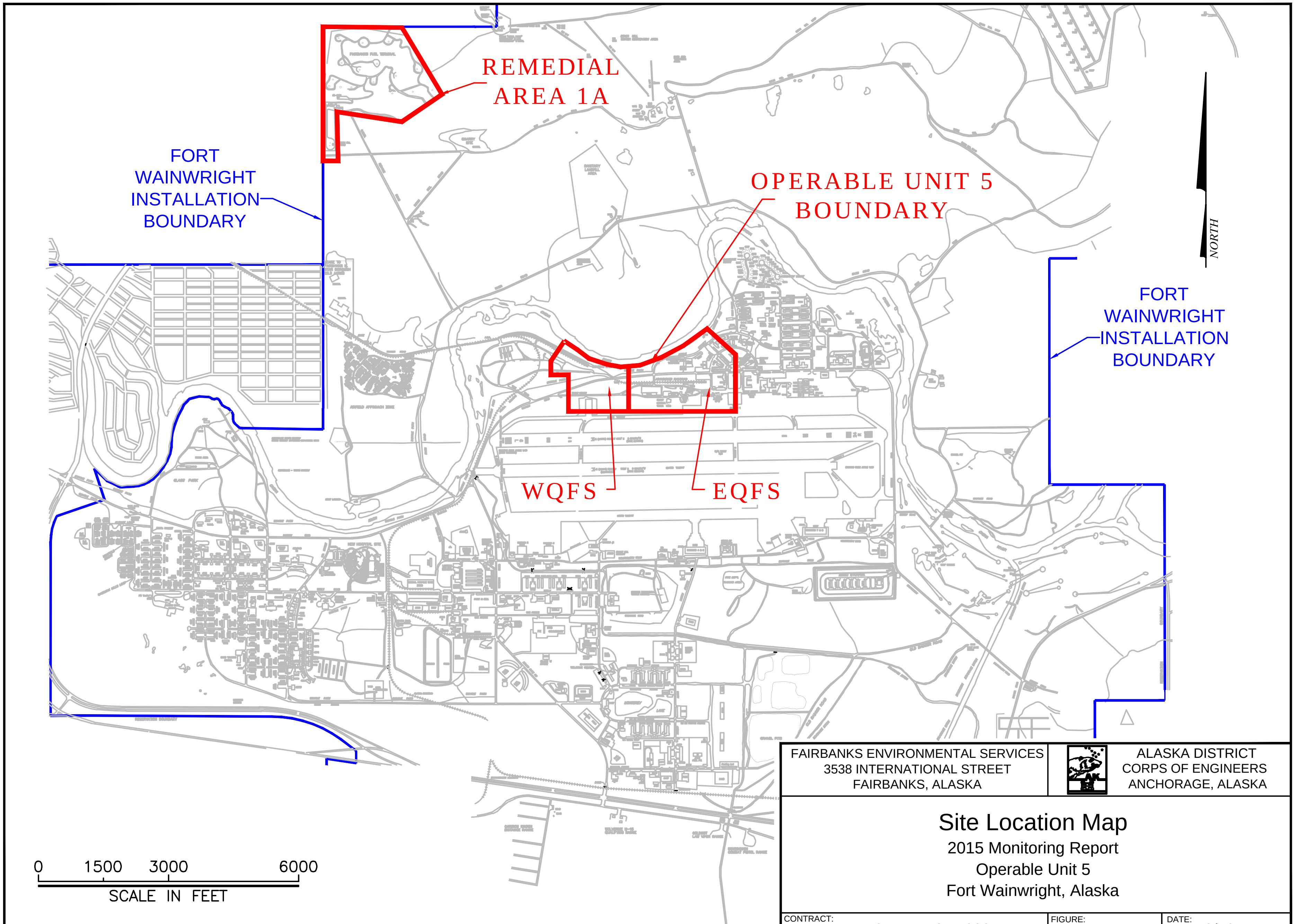


FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

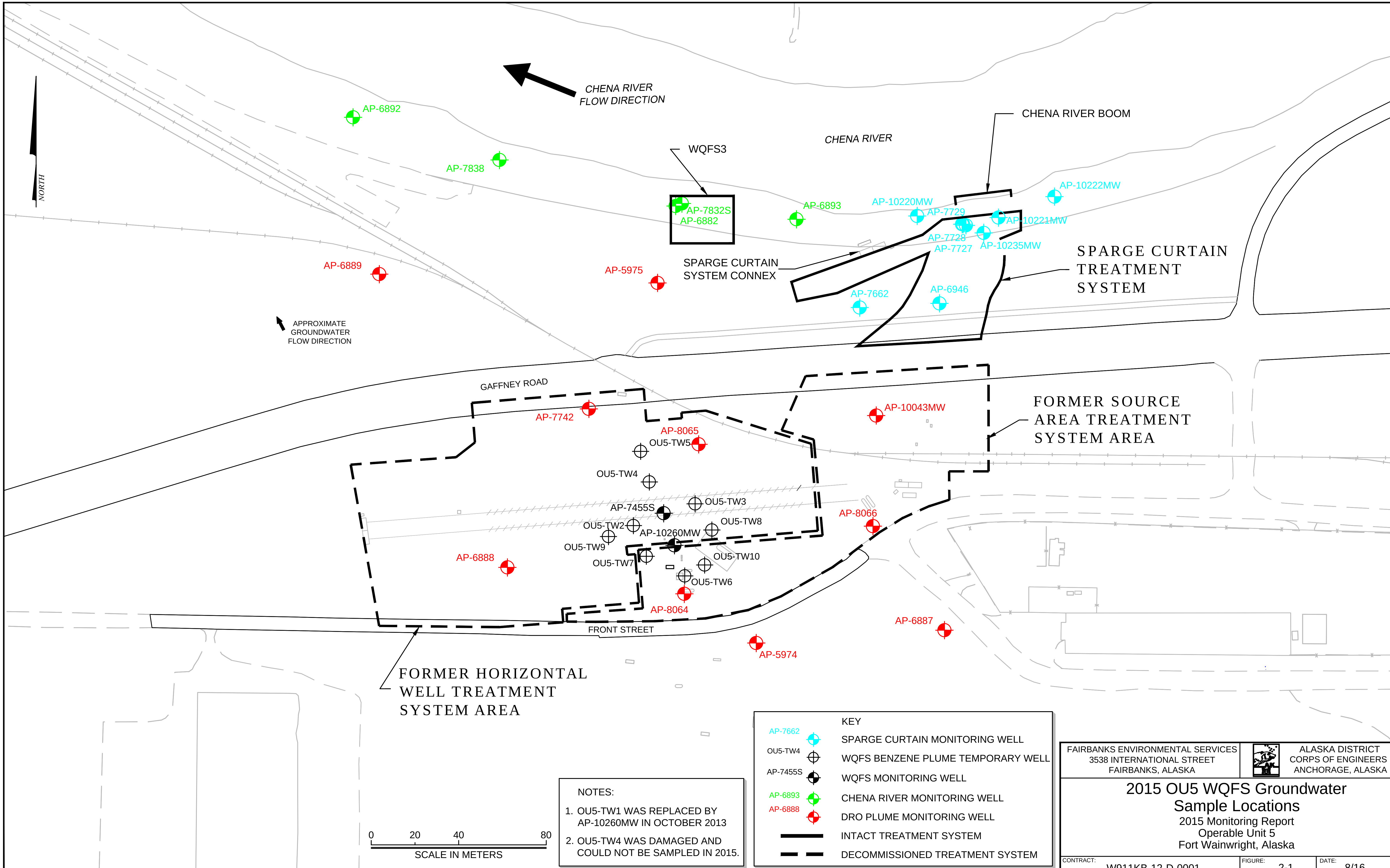
ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Site Location Map

2015 Monitoring Report
Operable Unit 5
Fort Wainwright, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-12-D-0001	1-1	8/16

FIG 1 SITE LOC



NOTES:

1. OU5-TW1 WAS REPLACED BY AP-10260MW IN OCTOBER 2013
2. OU5-TW4 WAS DAMAGED AND COULD NOT BE SAMPLED IN 2015.

KEY

AP-7662	SPARGE CURTAIN MONITORING WELL
OU5-TW4	WQFS BENZENE PLUME TEMPORARY WELL
AP-7455S	WQFS MONITORING WELL
AP-6893	CHENA RIVER MONITORING WELL
AP-6888	DRO PLUME MONITORING WELL
	INTACT TREATMENT SYSTEM
	DECOMMISSIONED TREATMENT SYSTEM

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

2015 OU5 WQFS Groundwater Sample Locations

2015 Monitoring Report
Operable Unit 5
Fort Wainwright, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-12-D-0001	2-1	8/16

FIG 2-1 SAMP LOCS

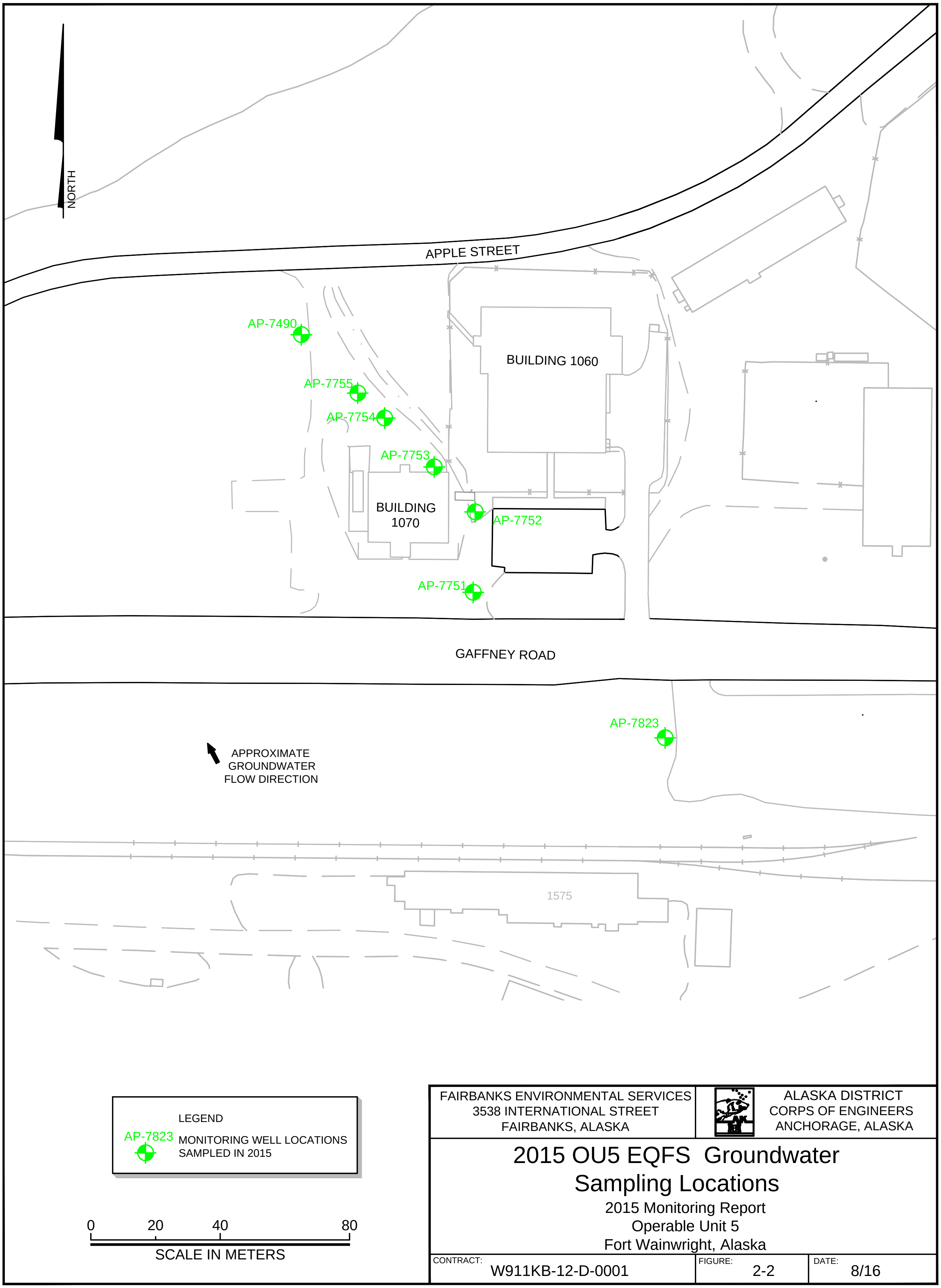


FIG 2-2 EQFS SAMP LOCS

Table 3-2 - Sparge Curtain Groundwater Monitoring Results

Probe/Well Number	Proximity of Treatment System Influence	Sample Numbers	Screened Interval (ft-bgs)	Date	Water Elevation (ft-msl)	Dissolved Oxygen (mg/L)	Redox (mV)	Dissolved Manganese (mg/L)	Dissolved Iron (mg/L)	Sulfate (mg/L)	ROD Contaminants of Concern								AWQS	
											GRO (µg/L)	DRO (µg/L)	Benzene (µg/L)	Toluene (µg/L)	TCE (µg/L)	1,2-DCA (µg/L)	EDB by 8260C (µg/L)	EDB by 504.1 (µg/L)	TAH (µg/L)	TAqH (µg/L)
ROD CLEANUP LEVELS (µg/L)											2,200	1,500	5	1,000	5	5	0.05	0.05	10	15
AP-6946	Within	11FW5S08WG	10-25	6/14/11	434.47	0.64	-35	NA	NA	NA	330	**22,000**	4.1	0.58	ND(0.5)	ND(0.5)	ND(2)	NA	NA	NA
		11FW5S34WG		9/13/11	435.60	1.25	-9.5	NA	NA	NA	270	**25,000**	4.7	1.0	ND(0.5)	0.20 J	ND(2)	NA	NA	NA
		12FW5S02WG		3/7/12	433.95	0.45	-85.7	4.1	8.2	12.4	270	**29,000**	**5.5**	2.3	ND(0.1)	ND(0.15)	ND(0.2)	NA	NA	NA
		12FW5S11WG		8/28/12	0.00	0.36	58.8	3.79	10.4	16.1	220	**18,000 QL**	4.5	0.63	ND(0.1)	0.08 J,Q	ND(0.2)	NA	NA	NA
		12FW5S12WG[1]						3.65	9.68	16.7	220	**21,000 QL**	4.2	0.6	ND(0.1)	ND(0.15) Q	ND(0.2)	NA	NA	NA
		13FW5S03WG		4/16/13	433.95	0.02	-14.6	4.26	11.1	12.8	270	**22,000**	**6.4**	0.7	ND(0.1)	ND(0.27)	ND(0.2)	NA	NA	NA
		14FWOU532WG		10/30/14	436.19	0.54	24.5	6.14	22	93.6	480	**33,000**	**9.9**	1.5	ND(0.1)	ND(0.15)	ND(0.2)	NA	NA	NA
		15FWOU509WG[3]		5/19/15	NA	NA	NA	5.77	34.1	28.4	420	**41,000**	**9.9**	1.5	ND(0.1)	ND(0.15)	ND(0.2)	NA	NA	NA
		15FWOU558WG		8/25/15	436.23	0.62	23.7	5.76 J-	41.3 J-	28.1	400	**43,000**	**8.3**	1.2	ND(0.1)	0.16 J	ND(0.2)	NA	NA	NA
AP-7727	Within	11FW5S06WG-B[2]	38-43	6/13/11	434.44	0.65	-22.7	NA	NA	NA	21 J	51 J	0.09 J	0.18 J	0.35 J	ND(0.5)	ND(2)	NA	NA	NA
		11FW5S32WG		9/12/11	435.36	1.04	-5.6	NA	NA	NA	16 J	71 J,B	0.090 J	0.30 J	0.35 J	ND(0.5)	ND(2)	NA	NA	NA
		12FW5S03WG		3/7/12	433.82	0.52	-60.7	1.4	3.4	25.3	23 J	40 J,B	0.14 J	1.1 J	0.34 J	ND(0.15)	ND(0.2)	NA	NA	NA
		12FW5S14WG		8/28/12	434.31	0.17	-30	1.31	3.21	23.3	24 J,B	45 J,QL	ND(0.1)	0.06 J	0.35 J	ND(0.15)	ND(0.2)	NA	NA	NA
		13FW5S01WG		4/16/13	434.71	0.08	10.2	1.4	3.55	25.6	13 J,B	61 J,B	ND(0.2)	0.1 J	0.38 J	ND(0.15)	ND(0.2)	NA	NA	NA
		14FWOU531WG		10/30/14	436.10	0.5	54.2	1.31	2.98	23.2	17 J	46 J	ND(0.1)	0.07 J	0.40 J	ND(0.15)	ND(0.2)	NA	NA	NA
		15FWOU506WG		5/19/15	435.60	1.41	53.6	1.39	3.33	26.4	ND(25)	50 J,B	ND(0.1)	0.06 J	0.40 J	ND(0.15)	ND(0.2)	NA	NA	NA
		15FWOU552WG		8/25/15	436.28	0.16	-62.2	1.28	3.09	25.8	15 J	84 J,B	ND(0.1)	0.09 J	0.40 J	0.08 J	ND(0.2) J-	NA	NA	NA
AP-7728	Within	11FW5S07WG	30-35	6/13/11	434.34	13.9	31.3	NA	NA	NA	ND(100)	38 J	ND(0.5)	0.13 J	0.20 J	ND(0.5)	ND(2)	NA	NA	NA
		11FW5S31WG		9/12/11	435.32	12.72	54.4	NA	NA	NA	ND(100)	77 J	ND(0.5)	0.17 J	0.11 J	ND(0.5)	ND(2)	NA	NA	NA
		12FW5S04WG		3/7/12	434.11	5.77	44.7	0.0008 J	ND(0.0004)	26.5	ND(25)	41 J,B	0.12 J	1.9	0.22 J	ND(0.15)	ND(0.2)	NA	NA	NA
		12FW5S15WG		8/28/12	434.31	0.25	89.5	1.34	0.01	23.9	32 J,B	52 J,QL	ND(0.1)	0.06 J	0.28 J	ND(0.15)	ND(0.2)	NA	NA	NA
		13FW5S02WG		4/16/13	433.70	0.06	53.6	2.74	0.0574	26.3	26 J,B	52 J,B	ND(0.1)	0.09 J	0.33 J	ND(0.15)	ND(0.2)	NA	NA	NA
		14FWOU529WG		10/29/14	436.14	0.34	67	2.65	0.023	23.3	28 J	57 J	ND(0.1)	0.06 J	0.34 J	ND(0.15)	ND(0.2)	NA	NA	NA
		15FWOU505WG		5/18/15	435.65	0.31	87.5	2.84	0.046	26.9	18 J	56 J,B	ND(0.1)	ND(0.1)	0.36 J	ND(0.15)	ND(0.2)	NA	NA	NA
		15FWOU553WG		8/25/15	436.27	0.15	8.5	2.81	0.034	26.2	ND(25)	63 J,B	ND(0.1)	0.13 J	0.33 J	ND(0.15)	ND(0.2) J-	NA	NA	NA
AP-7729	Within	11FW5S03WG	21-26	6/9/11	434.24	16.35	156.8	NA	NA	NA	ND(100)	35 J	0.06 J	0.22 J	ND(0.5)	ND(0.5)	ND(2)	ND(0.0096)	0.8	0.9
		11FW5S30WG		9/12/11	435.25	13.97	53.7	NA	NA	NA	ND(100)	61 J,B	ND(0.5)	0.23 J	ND(0.5)	ND(0.5)	ND(2)	ND(0.0095)	1.14	1.36
		12FW5S05WG		3/8/12	433.80	11.16	192.3	0.0004 J	ND(0.0004)	31.9	ND(25)	45 J,B	0.07 J	0.79	ND(0.5)	ND(0.15)	ND(0.2)	ND(0.004)	1.38	1.49
		12FW5S19WG		8/29/12	434.56	0.17	143.9	0.061	0.0036 J,B	28.2	ND(25)	40 J,B	ND(0.1)	0.14 J,B	0.26 J	ND(0.15)	ND(0.2)	ND(0.004)	0.74	0.90
		12FW5S20WG[1]						0.063	0.0041 J,B	28.3	ND(25)	39 J,B	ND(0.1)	0.14 J,B	0.26 J	ND(0.15)	ND(0.2)	ND(0.004)	0.74	0.89
		13FW5S06WG		4/17/13	433.65	0.31	90.9	0.445	ND(0.008)	28.1	15 J,B	56 J,B	ND(0.1)	0.06 J	0.26 J	ND(0.15)	ND(0.2)	ND(0.004)	0.66	0.74
		14FWOU527WG		10/29/14	436.08	0.28	66.3	2.51	0.152	26.2	34 J	56 J	ND(0.1)	ND(0.1)	0.37 J	ND(0.15)	ND(0.2)	ND(0.004)	0.70	0.81
		15FWOU504WG		5/18/15	435.59	0.68	95.3	2.75	0.223	27.5	ND(25)	59 J,B	ND(0.1)	ND(0.1)	0.32 J	ND(0.15)	ND(0.2)	ND(0.004)	0.50	0.61
		15FWOU554WG		8/25/15	436.26	0.12	9.9	2.78	0.23	26.6	15 J	85 J,B	ND(0.1)	0.08 J	0.35 J	ND(0.15)	ND(0.2)	ND(0.004)	0.48	0.59

Table 3-2 - Sparge Curtain Groundwater Monitoring Results

Probe/Well Number	Proximity of Treatment System Influence	Sample Numbers	Screened Interval (ft-bgs)	Date	Water Elevation (ft-msl)	Dissolved Oxygen (mg/L)	Redox (mV)	Dissolved Manganese (mg/L)	Dissolved Iron (mg/L)	Sulfate (mg/L)	ROD Contaminants of Concern: GRO (µg/L)	ROD Contaminants of Concern: DRO (µg/L)	ROD Contaminants of Concern: Benzene (µg/L)	ROD Contaminants of Concern: Toluene (µg/L)	ROD Contaminants of Concern: TCE (µg/L)	ROD Contaminants of Concern: 1,2-DCA (µg/L)	ROD Contaminants of Concern: EDB by 8260C (µg/L)	ROD Contaminants of Concern: EDB by 504.1 (µg/L)	AWQS: TAH (µg/L)	AWQS: TAqH (µg/L)
ROD CLEANUP LEVELS (µg/L)											2,200	1,500	5	1,000	5	5	0.05	0.05	10	15
AP-10235MW	Within	12FW5S06WG	18-23	3/8/12	NA	10.65	168.5	0.0011 J,Q	0.0035 J,Q	50	ND(100)	1,100 Q	0.12 J	1.5	ND(0.5)	ND(0.5)	ND(2)	ND(0.0097)	2.39	2.49
		12FW5S07WG[1]						0.0016 J,Q	0.0051 J,Q	50	ND(25)	550 Q	0.14 J	1.4	ND(0.5)	ND (0.5)	ND(0.2)	ND(0.004)	2.36	2.47
		12FW5S17WG		8/29/12	NA	1.27	83.9	0.046	0.019 J,B	34.9	14 J,B	600 J	ND(0.1)	0.08 J,B	0.13 J	ND(0.15)	ND(0.2)	ND(0.004)	0.68	0.83
		13FW5S10WG		4/17/13	NA	0.22	61.5	0.719	0.0291	26	ND(25)	1,100	0.11 J	0.07 J	0.14 J	ND(0.15)	ND(0.2)	ND(0.004)	0.68	0.7974
		14FWOU521WG		10/29/14	NA	0.3	60.4	2.31	0.125	25.9	17 J	1,400	0.16 J	0.07 J	0.17 J	ND(0.15)	ND(0.1)	ND(0.004)	0.73	0.88
		15FWOU502WG[3]		5/18/15	NA	NA	NA	2.97	0.497	29.9	17 J	1,100	ND(0.1)	ND(0.1)	0.17 J	ND(0.15)	ND(0.2)	ND(0.004)	0.5	0.71
		15FWOU555WG		8/25/15	NA	2.81	150.6	3.01	0.831	27.5	20 J	**2,200**	0.09 J	ND(0.1)	0.17 J	ND(0.15)	ND(0.2)	ND(0.004)	0.49	0.71
AP-10220MW	Within	11FW5S04WG	13-23	6/9/11	434.28	11.93	172.6	NA	NA	NA	ND(100)	480 J	0.06 J	0.27 J	ND(0.5)	ND(0.5)	ND(2)	ND(0.0095)	0.8	0.9
		11FW5S35WG		9/13/11	435.39	10.38	30.7	NA	NA	NA	ND(100)	500 J	ND(0.5)	0.33 J,Q	ND(0.5)	ND(0.5)	ND(2)	ND(0.0096)	1.2	1.4
		11FW5S36WG[1]						NA	NA	NA	ND(100)	490 J	ND(0.5)	0.64	ND(0.5)	ND(0.5)	ND(2)	ND(0.0097)	1.2	1.4
		12FW5S10WG		3/9/12	433.81	0.25	206.9	0.026	0.0046 J	28.3	ND(25)	880	0.25 J	1.3	0.23 J	ND(0.15)	ND(0.2)	ND(0.004)	2.18	2.28
		12FW5S16WG		8/29/12	434.53	0.23	37.1	3.98	0.08	23.5	36 J,B	**1,800**	1.1	0.10 J,B	0.21 J	ND(0.15)	ND(0.2)	ND(0.004)	1.58	1.74
		13FW5S07WG		4/17/13	433.64	0.32	61.1	4.08	2.08	23.3	28 J,B	1,300	0.85	0.06 J	0.26 J	ND(0.15)	ND(0.2)	ND(0.004)	1.41	1.53
		13FW5S08WG[1]						4.15	2.15	23.1	28 J,B	1,400	0.73	0.06 J	0.23 J	ND(0.15)	ND(0.2)	ND(0.004)	1.29	1.41
		14FWOU519WG		10/29/14	436.10	0.45	40.5	3.55	7.52	30.5	70 J	**3,300**	2.1	0.17 J	0.19	ND(0.15)	0.060 J	ND(0.004)	2.93	3.07
		14FWOU520WG[1]						3.61	7.57	32.6	71 J	**3,200**	2.1	0.18 J	0.18 J	ND(0.15)	0.050 J	ND(0.004)	2.91	3.22
		15FWOU507WG		5/19/15	435.48	0.55	24.9	2.99	10.1	25.2	39 J	1,300	1.0	ND(0.1)	0.23 J	ND(0.15)	ND(0.2)	ND(0.004)	1.40	1.65
		15FWOU508WG[1]						3.07	10.1	26.8	39 J	1,300	1.0	ND(0.1)	0.25 J	ND(0.15)	ND(0.2)	ND(0.004)	1.40	1.61
		15FWOU550WG		8/25/15	436.24	0.19	-87.5	2.9	11.2	25.1	36 J	**2300 J-**	1.2	ND(0.1)	0.23 J	ND(0.15)	ND(0.2) J-	ND(0.004)	1.60	1.84
		15FWOU551WG[1]						2.86	11.2	25.0	38 J	**2300 J-**	1.1	0.06 J	0.22 J	0.08 J	ND(0.2) J-	ND(0.004)	1.46	1.70
AP-10221MW	Within	11FW5S02WG	13-23	6/9/11	434.22	11.54	123	NA	NA	NA	13 J	160 J	ND(0.5)	0.21 J	ND(0.5)	ND(0.5)	ND(2)	ND(0.0095)	0.7	0.8
		11FW5S29WG		9/12/11	435.17	11.32	52.1	NA	NA	NA	ND(100)	240 J	ND(0.5)	0.69	ND(0.5)	ND(0.5)	ND(2)	ND(0.0096)	1.59	1.76
		12FW5S08WG		3/8/12	433.74	5.76	172.5	0.002 J	0.005 J	32.9	ND(100)	160 J	0.08 J	0.98	0.12 J	ND(0.15)	ND(0.2)	ND(0.004)	1.67	1.78
		12FW5S21WG		8/29/12	434.56	0.17	18.2	0.089	0.095	29.4	17 J,B	140 J,B,ML	ND(0.1)	0.2 J,B	0.24 J	ND(0.15)	ND(0.2)	ND(0.004)	0.80	0.93
		13FW5S05WG		4/17/13	433.62	0.27	99.6	0.172	0.182	29.9	ND(25)	190 J	ND(0.1)	ND(0.1)	0.24 J	ND(0.15)	ND(0.2)	ND(0.004)	0.7	0.79
		14FWOU525WG		10/29/14	436.05	0.31	72.8	1.68	0.024 J	28.9	15 J	200 J	ND(0.1)	0.08 J	0.27 J	ND(0.15)	ND(0.1)	ND(0.004)	0.68	0.80
		15FWOU503WG[3]		5/18/15	NA	NA	NA	1.93	0.211	30.5	14 J	200 J	ND(0.1)	ND(0.1)	0.27 J	ND(0.15)	ND(0.2)	ND(0.004)	0.5	0.62
		15FWOU556WG		8/25/15	436.13	0.42	-101.4	2.13	0.367	27.8	17 J	390 J	ND(0.1)	ND(0.1)	0.27 J	ND(0.15)	ND(0.2)	ND(0.004)	0.5	0.62
AP-10222MW	Outside	11FW5S01WG	13-23	6/9/11	434.29	9.82	76.4	NA	NA	NA	ND(100)	67 J	ND(0.5)	0.22 J	0.21 J	ND(0.5)	ND(2)	ND(0.0096)	0.7	0.8
		11FW5S28WG		9/12/11	435.19	5.9	77.3	NA	NA	NA	ND(100)	44 J	ND(0.5)	0.24 J	0.24 J	ND(0.5)	ND(2)	ND(0.0096)	1.11	1.33
		12FW5S09WG		3/9/12	433.78	0.35	105.3	0.59	0.014 J	29.3	ND(25)	52 J	0.07 J	0.82	0.28 J	ND(0.15)	ND(0.2)	ND(0.004)	1.33	1.46
		12FW5S18WG		8/29/12	434.59	0.76	33.2	0.67	0.017 J,B	29.1	14 J,B	48 J,B	ND(0.1)	0.12 J,B	0.27 J	ND(0.15)	ND(0.2)	ND(0.004)	0.72	0.87
		13FW5S09WG		4/17/13	433.68	0.22	75.4	0.989	0.0116 J	28.6	ND(25)	69 J,B	ND(0.1)	0.07 J	0.26 J	ND(0.15)	ND(0.2)	ND(0.004)	0.67	0.7515
		14FWOU523WG		10/29/14	436.11	0.29	74.6	1.27	0.003 J	31.3	ND(25)	52 J	ND(0.1)	0.09 J	0.27 J	ND(0.15)	ND(0.1)	ND(0.004)	0.69	0.80
		15FWOU501WG[3]		5/18/15	NA	NA	NA	1.43	0.016	29.8	ND(25)	60 J,B	ND(0.1)	ND(0.1)	0.29 J	ND(0.15)	ND(0.2)	ND(0.004)	0.5	0.61
		15FWOU557WG		8/25/15	436.23	0.41	98.0	1.64	0.059	29.5	ND(25)	66 J,B	ND(0.1)	ND(0.1)	0.31 J	ND(0.15)	ND(0.2)	ND(0.004)	0.5	0.62

Table 3-2 - Sparge Curtain Groundwater Monitoring Results

Probe/Well Number	Proximity of Treatment System Influence	Sample Numbers	Screened Interval (ft-bgs)	Date	Water Elevation (ft-msl)	Dissolved Oxygen (mg/L)	Redox (mV)	Dissolved Manganese (mg/L)	Dissolved Iron (mg/L)	Sulfate (mg/L)	ROD Contaminants of Concern								AWQS	
											GRO (µg/L)	DRO (µg/L)	Benzene (µg/L)	Toluene (µg/L)	TCE (µg/L)	1,2-DCA (µg/L)	EDB by 8260C (µg/L)	EDB by 504.1 (µg/L)	TAH (µg/L)	TAqH (µg/L)
ROD CLEANUP LEVELS (µg/L)											**2,200**	**1,500**	**5**	**1,000**	**5**	**5**	**0.05**	**0.05**	**10**	**15**
AP-7662	Outside	11FW5S05WG-B[2]	18-23	6/10/11	434.41	0.88	-15	1.34	5.47	7.00	620	**5,200**	1.7 QH	0.67 QH	ND(0.5)	ND(0.5)	ND(0.2)	NA	NA	NA
		11FW5S33WG		9/13/11	435.52	1.03	48.4	1.42	6.83	4.51	750	**5,200**	1.40	0.5 B	0.19 J	ND(0.5)	ND(2)	NA	NA	NA
		12FW5S01WG		3/7/12	433.84	6.02	-88.9	1.50	6.20	6.80	630	**7,200**	1.9 Q	2.2 Q	0.28 J,Q	ND(0.15) Q	ND(0.2) Q	NA	NA	NA
		12FW5S13WG		8/28/12	434.37	0.16	-38.5	1.66	7.54	4.1	590	**6,200 QL**	1.30	0.44 J	ND(0.1)	ND(0.15)	ND(0.2)	NA	NA	NA
		13FW5S04WG		4/16/13	433.74	0.02	-47.3	2.06	10.2	3.0	680	**7,700**	2.20	0.7	0.25 J	ND(0.15)	ND(0.2)	NA	NA	NA
		14FWOU533WG		10/30/14	436.11	0.35	-46.7	3.75	18.2	6.0	1,000	**8,100**	1.10	0.38 J	0.41 J	0.38 J	ND(1.0)	NA	NA	NA
		15FWOU510WG[3]		5/18/15	NA	NA	NA	3.12	14.8	6.7	740	**7,600**	1.80	0.36 J	ND(0.1)	ND(0.15)	ND(0.2)	NA	NA	NA
		15FWOU559WG		8/25/15	436.23	0.41	26.2	2.76	12.8	8.0	770	**7,000**	1.30 J-	0.41 J,J-	0.34 J,J-	ND(0.15) J-	ND(0.2) J-	NA	NA	NA

Notes:

Bold data is greater than the ADEC and/or ROD action levels

TAH and TAqH were calculated based on the sum of detections and the sum of the LOD for non-detect results. TAH is a summation of BTEX concentrations, and TAqH is a summation of BTEX and PAH compound results

Yellow highlighting indicates the water level was above the well screen at the time of the sampling event, for wells not intended to be screened below the water table

[1] Sample is a Field Duplicate of the sample immediately above.

[2] Sample ID 11FW5S06WG was inadvertantly duplicated. Sample IDs 11FW5S05WG and 11FW5S06WG were amended with "B" for clarification.

[3] Original field form could not be located. As a result, field parameters and water levels are not shown for these samples.

Acronyms:

AWQS - Alaska Water Quality Standard
bgs - below ground surface
btoc - below top of casing
1,2-DCA - 1,2-dichloroethane
DRO - diesel range organics
EDB - 1,2-dibromoethane
ft - feet
GRO - gasoline range organics
LOD - limit of detection
LOQ - limit of quantitation
msl - mean sea level
µg/L - micrograms per liter
mg/L - milligrams per liter
mV - millivolts
NA - not available or not applicable
NM - not measured
QC - quality control
ROD - Record of Decision
TAH - total aromatic hydrocarbons
TAqH - total aqueous hydrocarbons
TOC - top of casing

Data Qualifiers

ND - Not detected at the detection limit (LOD in parentheses; LOQ in parentheses for data prior to 2012.)
B - Result is qualified as a potential high estimate due to contamination present in a blank sample
J - Result is estimated due to a QC issue or because it is less than the LOQ. If result is biased low or high, it is specified as "J-" and "J+", respectively (for 2014 data and later).
Q - Result is estimated due to a QC failure (pre-2014 data only). If direction of bias is known, it is further indicated with a "L" (low) or "H" (high).
M - Result is biased due to matrix interference (pre-2014 data only). If direction of bias is known, it is further indicated with a "L" (low) or "H" (high).

Table 3-5. 2015 Sheen Observations Associated with the Chena River Boom

Date	Chena River Stage Height (ft)		Width of Exposed Shoreline (ft) at 0+60	Sheen Identification											
				Station ID											
	Fairbanks[1]	Chena Lakes[2]		0+20	0+30	0+40	0+50	0+60	0+70	0+80	0+90	1+00	1+10	1+20	1+30
6/1/2015	1.09	16.13	8.9												
6/12/2015	0.55	15.59	11.8												
6/18/2015	0.32	15.43	14.0												
6/23/2015	0.14	15.18	15.6												
7/3/2015	0.65	17.16	11.0												
7/8/2015	1.35	16.53	7.5												
7/14/2015	0.76	15.84	10.9												
7/23/2015	2.43	17.69	2.2												
8/1/2015	3.15	17.93	0*												
8/5/2015	2.18	17.18	3.5												
8/13/2015	2.28	17.26	3.2							X	X	X	X	X	X
8/17/2015	2.25	17.46	3.0												
8/26/2015	3.87	19.27	0*												
9/3/2015	6.25	21.39	0*												
9/8/2015	4.24	19.46	0*												
9/16/2015	4.50	19.58	0*												
9/21/2015	3.70	18.74	0*												
10/1/2015	4.32	19.29	0*												
10/13/2015	2.97	17.85	0*												

Notes:

* - indicates that there is no shoreline visible at the 0+60 station.

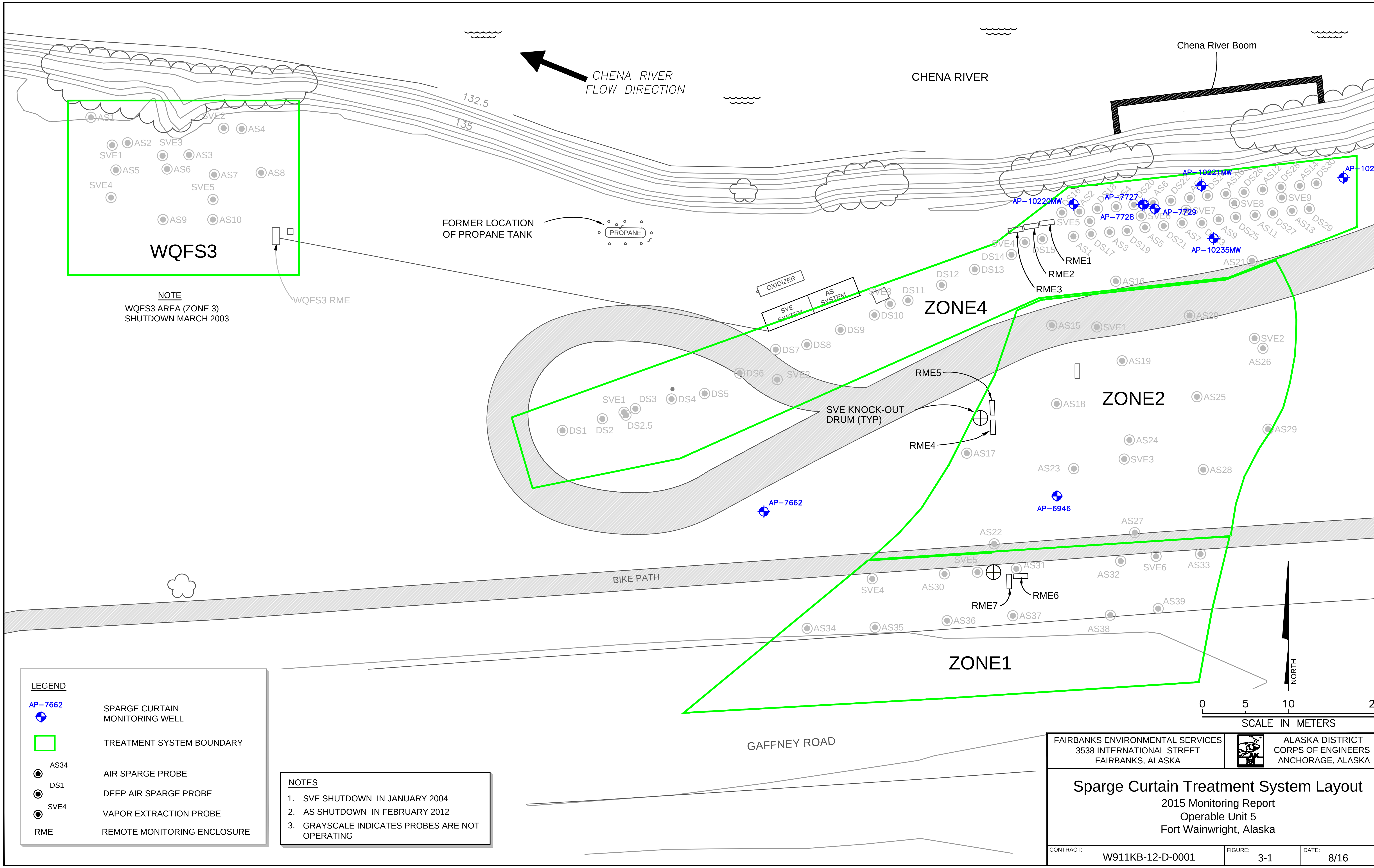
X - indicates that sheen was identified at this location during visual inspections

1. River stage height from http://water.weather.gov/ahps2/hydrograph.php?wfo=pafg&gage=chfa2&hydro_type=0
2. River stage height from http://water.weather.gov/ahps2/hydrograph.php?wfo=pafg&gage=mcda2

Acronyms:

ft - feet

ID - identification


CHENA RIVER FLOW DIRECTION
CHENA RIVER
Chena River Boom
132.5
135
FORMER LOCATION OF PROPANE TANK
PROPANE
WQFS3
WQFS3 RME
NOTE
WQFS3 AREA (ZONE 3) SHUTDOWN MARCH 2003
OXIDIZER
SVE SYSTEM
AS SYSTEM
ZONE4
ZONE2
ZONE1
SVE KNOCK-OUT DRUM (TYP)
RME1
RME2
RME3
RME4
RME5
RME6
RME7
AP-10220MW
AP-10221MW
AP-10222
AP-10235MW
AP-7727
AP-7728
AP-7729
AP-7662
AP-6946
BIKE PATH
GAFFNEY ROAD
NORTH
0 5 10 20
SCALE IN METERS
LEGEND
AP-7662 SPARGE CURTAIN MONITORING WELL
TREATMENT SYSTEM BOUNDARY
AS34 AIR SPARGE PROBE
DS1 DEEP AIR SPARGE PROBE
SVE4 VAPOR EXTRACTION PROBE
RME REMOTE MONITORING ENCLOSURE
NOTES
1. SVE SHUTDOWN IN JANUARY 2004
2. AS SHUTDOWN IN FEBRUARY 2012
3. GRAYSCALE INDICATES PROBES ARE NOT OPERATING
FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA
ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA
Sparge Curtain Treatment System Layout
2015 Monitoring Report
Operable Unit 5
Fort Wainwright, Alaska
CONTRACT: W911KB-12-D-0001
FIGURE: 3-1
DATE: 8/16
FIG 3-1 TRE SYS LAY

AP-7728 (30 - 35) — System shut off February 2012 (between Sept-11 and Mar-12)

AP-7728 30 - 35	Apr-99	Dec-99	Aug-00	Jul-01	Feb-02	May-03	May-04	May-05	June-06	June-07	May-08	June-09	July-10	June-11	Sept-11	Mar-12	Aug-12	April-13	Oct-14	May-15	Aug-15
GW EL.	432.87	435.10	434.12	433.92	NM	430.09	430.80	430.84	429.45	429.28	429.78	429.31	434.84	434.34	435.32	434.11	434.31	433.70	436.14	435.65	436.27
DRO	ND(250)	ND(309)	ND(100)	110	150	108	111	ND(319)	46	39	20	20	69	38	77	41	52	52	57	56	63
GRO	ND(100)	ND(90)	ND(100)	20	ND(67)	ND(90)	ND(90)	ND(90)	21	ND(100)	ND(100)	ND(13)	ND(100)	ND(100)	ND(100)	ND(100)	32	26	28	ND(25)	15
BENZENE	ND(1)	ND(1)	ND(2)	ND(0.18)	ND(2)	ND(0.4)	ND(0.4)	ND(0.4)	ND(1)	ND(0.5)	ND(0.5)	0.14	ND(0.5)	ND(0.5)	ND(0.5)	0.12	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
TOLUENE	ND(1)	ND(1)	ND(2)	ND(0.25)	ND(2)	ND(1)	ND(1)	ND(1)	ND(1)	0.17	0.22	0.95	0.55	0.13	0.17	0.17	0.17	0.09	0.06	ND(0.1)	0.13
TCE	ND(1)	ND(1)	ND(2)	ND(0.26)	ND(2)	ND(1)	ND(1)	ND(1)	ND(1)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	0.20	0.11	1.9	0.22	0.33	0.34	0.36	0.33
1,2-DCA	ND(1)	ND(1)	ND(2)	ND(0.37)	ND(2)	ND(1)	ND(0.5)	ND(0.5)	ND(1)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.15)	ND(0.15)	ND(0.15)	ND(0.15)	ND(0.15)
EDB	ND(1)	ND(1)	ND(2)	ND(0.0034)	ND(0.00909)	ND(1)	ND(1)	ND(1)	ND(1)	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)

AP-7729 (21 - 26) — System shut off February 2012 (between Sept-11 and Mar-12)

AP-7729 21 - 26	Apr-98	Dec-99	Aug-00	Jul-01	Feb-02	May-03	May-04	May-05	June-06	May-07	May-08	June-09	July-10	June-11	Sept-11	Mar-12	Aug-12	April-13	Oct-14	May-15	Aug-15
GW EL.	NA	434.68	434.09	433.82	NM	430.02	430.74	430.72	429.45	428.87	429.78	429.21	434.45	434.24	435.25	433.80	434.56	433.65	436.08	435.59	436.26
DRO	83,000	ND(300)	ND(100)	110	82	127	106	ND(300)	41	66	38	88	51	35	61	45	40	56	56	59	85
GRO	6,000	ND(90)	ND(100)	ND(6.7)	ND(67)	ND(90)	ND(90)	ND(90)	14	ND(100)	ND(100)	ND(13)	ND(100)	ND(100)	ND(100)	ND(100)	ND(25)	15	34	34	34
BENZENE	42	ND(1)	ND(2)	ND(0.18)	ND(2)	ND(0.4)	ND(0.4)	ND(0.4)	ND(1)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	0.06	ND(0.5)	0.07	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
TOLUENE	380	ND(1)	ND(2)	ND(0.25)	ND(2)	ND(1)	ND(1)	ND(1)	ND(1)	0.21	0.20	0.11	0.29	0.22	0.23	0.79	0.14	0.06	ND(0.1)	ND(0.1)	0.08
TCE	ND(1)	ND(1)	ND(2)	ND(0.26)	ND(2)	ND(1)	ND(1)	ND(1)	ND(1)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	0.26	0.26	0.37	0.32	0.35
1,2-DCA	ND(1)	ND(1)	ND(2)	ND(0.37)	ND(2)	ND(1)	ND(0.5)	ND(0.5)	ND(1)	ND(0.5)	ND(0.5)	0.18	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.15)	ND(0.15)	ND(0.15)	ND(0.15)	ND(0.15)
EDB	ND(1)	ND(1)	ND(0.03)	ND(0.0034)	ND(0.00909)	ND(1)	ND(0.0181)	ND(0.0190)	ND(0.02)	ND(0.0090)	ND(0.0096)	ND(0.0097)	ND(0.0097)	ND(0.0096)	ND(0.0095)	ND(0.0097)	ND(0.004)	ND(0.004)	ND(0.004)	ND(0.004)	ND(0.004)
TAH								2.7	3	1.2	1.2	1.1	1.3	0.8	1.14	1.38	0.74	0.66	0.70	0.50	0.48
TAqH								3.2	3.8	1.4	1.3	1.2	1.5	0.9	1.36	1.49	0.90	0.74	0.81	0.61	0.59

AP-7727 (38 - 43) — System shut off February 2012 (between Sept-11 and Mar-12)

AP-7727 38 - 43	Apr-99	Dec-99	Oct-02	May-03	May-04	May-05	June-06	June-07	May-08	June-09	July-10	June-11	Sept-11	Mar-12	Aug-12	April-13	Oct-14	May-15	Aug-15
GW EL.	436.19	434.81	430.50	430.11	430.82	430.89	429.26	429.26	429.83	429.35	434.42	434.44	435.36	433.82	434.31	434.71	436.10	435.60	436.28
DRO	ND(250)	ND(300)	ND(549)	102	130	70.7	63	47	23	36	53	51	71	40	45	61	46	50	84
GRO	ND(100)	ND(90)	ND(90)	ND(90)	11.1	ND(90)	19	ND(100)	20	17	19	21	16	23	24	13	17	ND(25)	15
BENZENE	ND(1)	ND(1)	ND(0.5)	ND(0.4)	ND(0.4)	ND(0.4)	ND(1)	ND(0.5)	0.07	0.17	0.07	0.09	0.09	0.14	ND(0.1)	ND(0.2)	ND(0.1)	ND(0.1)	ND(0.1)
TOLUENE	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	0.19	0.16	1.3	0.27	0.18	0.30	1.1	0.06	0.10	0.07	0.06	0.09
TCE	ND(1)	ND(1)	ND(1)	ND(1)	0.38	ND(1)	0.25	0.28	0.34	0.36	0.32	0.35	0.35	0.34	0.35	0.38	0.40	0.40	0.40
1,2-DCA	ND(1)	ND(1)	ND(1)	ND(1)	ND(0.5)	ND(0.5)	ND(1)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.15)	ND(0.15)	ND(0.15)	ND(0.15)	0.08
EDB	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)

AP-10221MW (13 - 23) — System shut off February 2012 (between Sept-11 and Mar-12)

AP-10221MW 13 - 23	June-11	Sept-11	Mar-12	Aug-12	April-13	Oct-14	May-15	Aug-15
GW EL.	434.22	435.17	433.74	434.56	433.62	436.05	NA	436.13
DRO	160	240	160	140	190	200	200	390
GRO	13	ND(100)	ND(100)	17	ND(25)	15	14	17
BENZENE	ND(0.5)	ND(0.5)	0.08	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
TOLUENE	0.21	0.69	0.98	0.2	ND(0.1)	0.08	ND(0.1)	ND(0.1)
TCE	ND(0.5)	ND(0.5)	0.12	0.24	0.24	0.27	0.27	0.27
1,2-DCA	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.15)	ND(0.15)	ND(0.15)	ND(0.15)	ND(0.15)
EDB	ND(0.0095)	ND(0.0096)	ND(0.0096)	ND(0.004)	ND(0.004)	ND(0.004)	ND(0.004)	ND(0.004)
TAH	0.70	1.59	1.67	0.80	0.70	0.68	0.5	0.62
TAqH	0.80	1.76	1.78	0.93	0.79	0.80	0.5	0.62

AP-10222MW (13 - 23) — System shut off February 2012 (between Sept-11 and Mar-12)

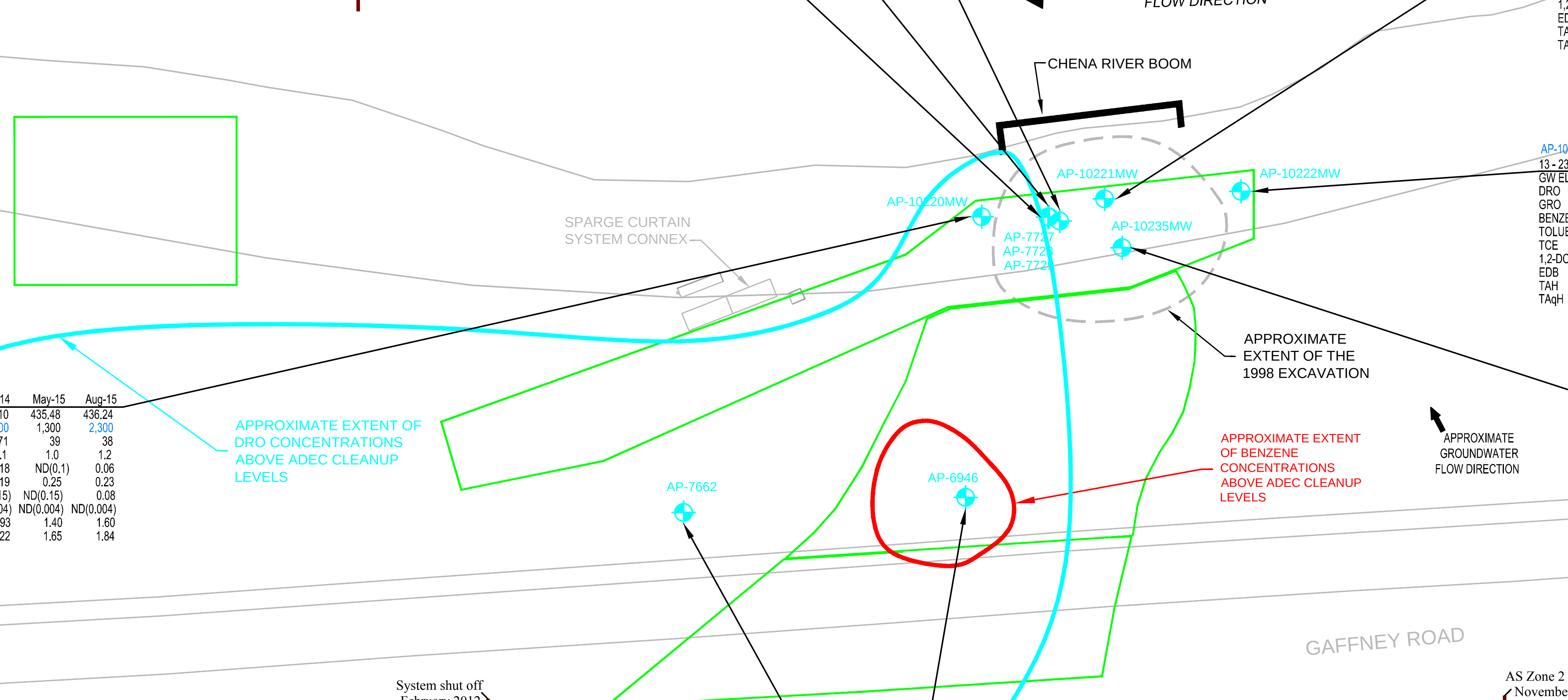
AP-10222MW 13 - 23	June-11	Sept-11	Mar-12	Aug-12	April-13	Oct-14	May-15	Aug-15
GW EL.	434.29	435.19	433.78	434.59	433.68	436.11	NA	436.23
DRO	67	44	52	48	69	52	60	66
GRO	ND(100)	ND(100)	ND(100)	14	ND(25)	ND(25)	ND(25)	ND(25)
BENZENE	ND(0.5)	ND(0.5)	0.07	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
TOLUENE	0.22	0.24	0.82	0.12	0.07	0.09	ND(0.1)	ND(0.1)
TCE	0.21	0.24	0.28	0.27	0.26	0.27	0.29	0.31
1,2-DCA	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.15)	ND(0.15)	ND(0.15)	ND(0.15)	ND(0.15)
EDB	ND(0.0096)	ND(0.0096)	ND(0.0096)	ND(0.004)	ND(0.004)	ND(0.004)	ND(0.004)	ND(0.004)
TAH	0.7	1.11	1.33	0.72	0.67	0.69	0.5	0.61
TAqH	0.8	1.33	1.46	0.87	0.75	0.80	0.5	0.62

AP-10220MW (13 - 23)

AP-10220MW 13 - 23	June-11	Sept-11	Mar-12	Aug-12	April-13	Oct-14	May-15	Aug-15
GW EL.	434.28	435.39	433.81	434.53	433.64	436.10	435.48	436.24
DRO	480	500	880	1,800	1,400	3,300	1,300	2,300
GRO	ND(100)	ND(100)	ND(100)	36	28	71	39	38
BENZENE	0.06	ND(0.5)	0.25	1.1	0.85	2.1	1.0	1.2
TOLUENE	0.27	0.33	1.3	0.10	0.06	0.18	ND(0.1)	0.06
TCE	ND(0.05)	ND(0.5)	0.23	0.21	0.26	0.19	0.25	0.23
1,2-DCA	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.15)	ND(0.15)	ND(0.15)	ND(0.15)	0.08
EDB	ND(0.0095)	ND(0.0096)	ND(0.0096)	ND(0.004)	ND(0.004)	ND(0.004)	ND(0.004)	ND(0.004)
TAH	0.8	1.21	2.18	1.58	1.41	2.93	1.40	1.60
TAqH	0.9	1.39	2.28	1.74	1.53	3.22	1.65	1.84

AP-10235MW (18-23) — System shut off February 2012 (before Mar-12)

AP-10235MW 18-23	Mar-12	Aug-12	April-13	Oct-14	May-15	Aug-15
GW EL.	NA	NA	NA	NA	NA	NA
DRO	1,100	550	1,100	1,400	1,100	2,200
GRO	ND(100)	ND(100)	ND(25)	17	17	20
BENZENE	0.12	0.14	0.11	0.16	ND(0.1)	0.09
TOLUENE	1.5	1.4	0.07	0.07	ND(0.1)	ND(0.1)
TCE	ND(0.5)	ND(0.5)	0.14	0.17	0.17	0.17
1,2-DCA	ND(0.5)	ND(0.5)	ND(0.15)	ND(0.15)	ND(0.15)	ND(0.15)
EDB	ND(0.0097)	ND(0.0095)	ND(0.004)	ND(0.004)	ND(0.004)	ND(0.004)
TAH	2.39	0.68	0.68	0.73	0.5	0.71
TAqH	2.36	0.83	0.80	0.88	0.49	0.71



AP-7662 (18 - 23) — System shut off February 2012 (between Sept-11 and Mar-12)

AP-7662 18 - 23	Sep-98	Apr-99	Dec-99	Mar-00	Apr-01	Feb-02	May-03	May-04	May-05	June-06	May-07	May-08	June-09	July-10	June-11	Sept-11	Mar-12	Aug-12	April-13	Oct-14	May-15	Aug-15
GW EL.	435.14	433.14	434.02	433.76	434.09	NM	435.21	435.91	435.59	434.37	434.30	434.90	434.48	434.40	434.41	435.52	433.84	434.37	433.74	436.11	NA	436.23
DRO	1,200	1,900	3,840	6,100	11,000	2,400	6,180	9,490	5,200	6,500	6,700	8,000	4,800	3,600	5,200	5,200	7,200	6,200	7,700	8,100	7,600	7,000
GRO	1,900	2,100	2,410	2,700	2,600	2,100	446	83	238	710	710	660	540	660	620	750	630	590	680	1,000	740	770
BENZENE	69	130	155	200	240	46	3.95	1.62	4.95	3.4	2.8	3.1	1.1	2.3	1.7	1.4	1.9	1.3	2.2	1.1	1.8	1.3
TOLUENE	9	3	17.4	24	51	0.64J	ND(1)	ND(1)	ND(1)	0.85	1.2	1.9	0.46	1.1	0.67	0.50	2.2	0.44	0.70	0.38	0.36	0.41
TCE	ND(1)	ND(1)	ND(10)	ND(1)	ND(0.26)	ND(2)	ND(1)	ND(1)	ND(1)	ND(10)	0.22	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	0.19	0.28	ND(0.1)	0.25	0.41	ND(0.1)	0.34
1,2-DCA	ND(1)	ND(1)	ND(10)	2.6	ND(0.37)	ND(2)	ND(1)	ND(0.5)	ND(0.5)	ND(10)	0.23	ND(0.5)	0.56	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.15)	ND(0.15)	0.38	ND(0.15)	ND(0.15)
EDB	ND(1)	ND(1)	ND(10)	ND(1)	NA	ND(0.00909)	ND(1)	ND(1)	ND(1)	ND(1)	ND(2)	ND(2)	ND(2)	ND(0.0097)	ND(0.2)	ND(2)	ND(2)	ND(0.2)	ND(0.2)	ND(1)	ND(0.2)	ND(0.2)

AP-6946 (10 - 25) — AS Zone 2 shut off November 2006 (between June-06 and June-07); AS Zone 2 restarted January 2010 (between June-09 and July-10); System shut off February 2012 (between Sept-11 and Mar-12)

AP-6946 10 - 25	Sep-95	Apr-98	Apr-99	Dec-99	Aug-00	Jul-01	Feb-02	May-03	May-04	May-05	June-06	June-07	May-08	June-09	July-10	June-11	Sept-11	Mar-12	Aug-12	April-13	Oct-14	May-15	Aug-15
GW EL.	437.99	431.13	432.94	434.12	434.25	434.35	NM	430.14	435.04	430.38	429.30	429.32	428.87	429.40	434.30	434.47	435.60	433.95	434.45	433.95	436.19	NA	436.23
DRO	1,740	92,000	13,000	3,260	1,000	2,700	2,000	5,150	18,900	15,300	12,000	1,900	5,500	19,000	17,000	22,000	25,000	29,000	21,000	22,000	33,000	41,000	43,000
GRO	3,700	8,800	7,600	5,020	4,600	2,000	500	472	309	298	240	140	250	260	240	330	270	270	220	270	480	420	400
BENZENE	220	630	940	324	450	210	2.1	5.5	0.25	ND(0.4)	0.14	0.19	1.0	3.4	3.0	4.1	4.7	5.5	4.5	6.4	9.9	9.9	8.3
TOLUENE	ND(5)	520	220	92.2	110	77	ND(2)	0.430	ND(1)	ND(1)	0.14	0.15	0.42	0.5	0.69	0.58	1.0	2.3	0.63	0.70	1.5	1.5	1.2
TCE	ND(5)	ND(1)	ND(1)	ND(1)	ND(10)	ND(0.26)	ND(2)	ND(1)	ND(1)	ND(1)	ND(1)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
1,2-DCA	2	ND(1)	7	ND(1)	ND(10)	ND(0.37)	ND(2)	ND(1)	ND(0.5)	ND(0.5)	ND(1)	ND(0.5)	ND(0.5)	ND(0.5)	0.18	ND(0.5)	0.20	ND(0.5)	0.08	ND(0.27)	ND(0.15)	ND(0.15)	0.16
EDB	NR	ND(1)	ND(1)	ND(0.02)	ND(10)	ND(0.0034)	ND(0.00909)	ND(1)	ND(1)	ND(1)	ND(1)	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)

0 10 20 40
SCALE IN METERS

LEGEND:

AP-6946	Monitoring Well	TAH	Total Aromatic Hydrocarbons
	Approximate DRO Plume	TAqH	Total Aqueous Hydrocarbons
	Approximate Benzene Plume	TCE	Trichloroethene
	Treatment System Boundary	LOD	Limits of Detection
1,2-DCA	1,2-Dichloroethane	ND(4)	Not detected (LOD)
EDB	1,2-Dibromoethane	NA	Not Analyzed
GRO	Gasoline Range Organics	RG	Remedial Goal
DRO	Diesel Range Organics	µg/L	Micrograms per Liter

NOTES:

1. Due to space limitations, analytical data for only one sample event per year between 1999 and 2010 is shown. Spring / summer data is shown over fall / winter data because concentrations are generally higher.
2. TAH and TAqH concentrations for 2012 and 2013 were calculated using LOD for ND analytes.
3. Cleanup level for GRO changed from 1,300 µg/L to 2,200 µg/L in October 2008.
4. Groundwater elevations are shown in either NAVD-88 or NGVD-29 datum's. A comprehensive survey of the monitoring wells in the groundwater sampling program occurred in the summer of 2010. All Elevations after July 2010 are in NAVD-88.
5. AP-7662 is shown because it is within proximity of the Sparge Curtain.
6. SVE portion of the treatment system was shutdown in January 2004. The AS portion of the treatment system was shutdown in February 2012.

Screened interval (feet below ground surface)
Well number
Sampling Date
Groundwater elevation in feet (ft) above sea level NAVD-88

AP-6946 10 - 25	Sep-95	Apr-98	Apr-99	Dec-99
GW EL.	437.99	431.13	432.94	434.12
DRO	1,740	92,000	13,000	3,260
GRO	3,700	8,800	7,600	5,020
BENZENE	220	630	940	324
TOLUENE	ND(5)	520	220	92.2
TCE	ND(5)	ND(1)	ND(1)	ND(1)
1,2-DCA	2	ND(1)	7	ND(1)
EDB	NR	ND(1)	ND(1)	ND(0.02)

Concentration in in µg/L
Concentrations exceeding RGs shown in blue.

Contaminant of Concern	RG µg/L
DRO	1,500
GRO	2,200
BENZENE	5
TOLUENE	1,000
TCE	5
1,2-DCA	5
TAH	10
TAqH	15

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Sparge Curtain Groundwater Contaminant Concentrations

2015 Monitoring Report
Operable Unit 5
Fort Wainwright, Alaska

CONTRACT: W911KB-12-D-0001 | FIGURE: 3-2 | DATE: 8/16

FIG 3-2 SC ANALYTICAL

MONITORING WELL

NUMBER OF SHEEN OBSERVATIONS

- 0
- 1
- 2 - 5
- 6 - 10
- 10 - 15

NOTES:

1. Observation stations were established in 2012 and are marked at 10-foot intervals along the shoreline, starting at 0+00.
2. Number of inspections = observations with the boom attached to the supports

YEAR	INSPECTIONS	DETECTIONS	DEPLOYMENT DATES
2012	26	9	5/14 - 10/5
2013	21	8	6/19 - 10/2
2014	4	1	5/22 - 10/3
2015	11	1	5/19 - 10/21

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Chena River Sheen Observations - 2012 through 2015

2015 Monitoring Report
Operable Unit 5
Fort Wainwright, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-12-D-0001	3-3	8/16

Table 4-2 - WQFS Benzene Area Groundwater Monitoring Results

Probe/Well Number	Sample Numbers	Screened Interval (ft-bgs)	Date	Water Level (ft btoc)	Water Elevation (ft-msl)	Dissolved Oxygen (mg/L)	Redox (mV)	Dissolved Manganese (mg/L)	Dissolved Iron (mg/L)	Sulfate (mg/L)	GRO (µg/L)	DRO (µg/L)	Benzene (µg/L)	Toluene (µg/L)	TCE (µg/L)	1,2-DCA (µg/L)	EDB by 8260C (µg/L)	EDB by 504.1 (µg/L)
											ROD Contaminants of Concern							
ROD CLEANUP LEVELS (µg/L)											**2,200**	**1,500**	**5**	**1,000**	**5**	**5**	**0.05**	**0.05**
AP-7455S	11FW5204WG	19-24	6/15/11	19.77	434.60	0.72	-31.4	5.26	18.00	14.9	110	**4,600**	**18**	0.19 J	ND(0.5)	0.93	ND(2)	ND(0.0096)
	11FW5205WG[1]			19.77				5.22	17.60	14.5	110	**4,900**	**17**	0.24 J	ND(0.5)	ND(1.1)	ND(2)	ND(0.0097)
	12FW5B12WG		8/31/12	18.62	435.748	0.14	-86.7	7.47	17.1	14.8	62 B	**2,100 QL**	**11 B**	0.09 J	ND(0.1)	0.58	ND(0.2)	ND(0.004)
	13FW5B07WG		4/17/13	19.86	434.508	0.13	-148.2	1.88 QL	5.57 QL	40.4	150 B	**6,400**	**19**	0.26 J	ND(0.1)	1.2	ND(0.2)	NA
	14FW5B01WG		4/17/14	19.92	434.448	0.53	-83.3	4.54	20	176	140	**5,200**	**17**	0.19 J	ND(0.1)	1.1	ND(0.2)	NA
	14FWOU517WG		10/28/14	17.59	436.778	0.32	-97.6	5.25	33.7	148	210	**8,600**	**9**	0.58	0.11 J	0.67	ND(0.2)	NA
	15FWOU539WG		5/26/15	18.62	435.748	0.34	-4.2	5.62	30.4	161	220	**7,400**	**14**	0.30 J	0.18 J	1.4	ND(0.2)	NA
OU5-TW1[2]	11FW5206WG	14-19	6/15/11	16.59	NA	2.27	-78.5	2.09	108	2.79	**22,000**	**50,000**	**920**	**2,900**	**13**	**21**	ND(20)	0.0088 J
	12FW5B05WG		8/28/12	19.69	NA	0.85	-36.3	2.70	57	3.30	**7,900**	**16,000 QL**	**230 QL**	620 QL	2.5 QL	3.8 QL	ND(0.4)QL	NA
	13FW5B03WG		4/16/13	21.5	NA	0.11	-184	2.70 QL	8.39 QL	29.1	**3,600**	**5,800**	**69 Q**	99 Q	0.73 Q	2.2 Q	ND(0.2)Q	NA
AP10260MW	14FW5B02WG		4/17/14	19.71	NA	4.06	-66.5	4.85	70.1	1600	**7,900**	**12,000**	**150**	400	3	ND(0.3)	ND(4)	NA
	14FW5B03WG[1]							4.81	69.9	1570	**8,200**	**13,000**	**160**	420	3.2	4.4	ND(4)	NA
	14FWOU526WG		10/29/14	17.37	NA	0.55	-94.1	3.83	88.0	1600	**4,600**	**30,000**	**230**	8.7	4.1	**5.8**	ND(0.2)	NA
	15FWOU537WG		5/21/15	17.92	NA	0.26	-18.1	3.52	26.40	246	**2,200**	**9,200**	**58**	2.1	1.9	ND(0.15)	ND(0.2)	NA
OU5-TW2	11FW5207WG	14-19	6/16/11	16.08	NA	1.14	0.3	5.28	4.45	17.8	260	**4,800**	**28**	0.38 J	0.16 J	0.65	ND(2)	ND(0.0096)
	12FW5B10WG		8/28/12	18.16	NA	0.19	-50.1	4.42	15.9	16.2	170	**3,500 QL**	**19**	0.22 J	0.15 J	0.56	ND(0.2)	NA
	13FW5B04WG		4/16/13	18.95	NA	0.51	-71.6	6.62	27.9	6.66	NA	**22,000**	**60**	0.96	0.50	2.7	ND(0.2)	NA
	14FW5B11WG		4/18/14	19.01	NA	0.93	-46.4	6.13	34.9	9.45	650	**15,000**	**43**	1.00	0.26 J	0.84	ND(0.2)	NA
	14FWOU510WG		10/28/14	16.67	NA	0.61	14	3.90	17.7	13.30	NA	**4,000**	**21**	0.18 J	0.10 J	0.44 J	ND(0.2)	NA
	15FWOU526WG		5/20/15	17.2	NA	0.82	-50	6.49	38.2	9.60	NA	**14,000**	**29**	2.70	0.43 J	ND(0.15)	ND(0.2)	NA
OU5-TW3	11FW5211WG	14-19	6/16/11	16.28	NA	0.67	-51.8	8.62	48.9	1.01	160	**34,000**	**9.9**	0.58	ND(0.5)	0.65	ND(2)	ND(0.0096)
	12FW5B11WG		8/28/12	19.4	NA	0.16	-105.6	7.47 QL	49.3 QL	4.4	110 B	**20,000 QL**	**9.7**	0.66	ND(0.1)	0.62	ND(0.2)	NA
	13FW5B05WG		4/16/13	20.16	NA	0.22	-99	8.03	53.1	0.83	NA	**12,000**	**11**	1.8	ND(0.29)	ND(1.1)	ND(0.2)	NA
	14FW5B06WG		4/17/14	20.21	NA	0.34	-80.9	8.23	54.9	0.55	130	**12,000**	**6.8**	1.1	ND(0.1)	0.64	ND(0.2)	NA
	14FWOU518WG		10/28/14	17.89	NA	0.52	-70	6.60	69.8	5.50	NA	**27,000**	**5.2**	0.7	ND(0.1)	0.49 J	ND(0.2)	NA
	15FWOU540WG		5/26/15	18.87	NA	0.38	16.9	11.70	92.5	1.10	NA	**25,000**	4.9	1.4	ND(0.1)	0.55	ND(0.2)	NA
OU5-TW4	11FW5210WG	14-19	6/15/11	18.14	NA	1.01	14.2	9.71	0.039	18.7	72 J	**10,000**	**7.4**	0.18 J	ND(0.5)	ND(0.95)	ND(2)	ND(0.0095)
	12FW5B07WG		8/28/12	18.19	NA	0.17	53.9	11.9	0.085	16	41 J,B	**4,200 QL**	3.0	0.16 J	ND(0.1)	0.51	ND(0.2)	NA
	13FW5B06WG		4/16/13	19.08	NA	0.24	73	12.2	0.149	16.7	NA	**3,900**	2.9	0.12 J	ND(0.1)	0.66	ND(0.2)	NA
	14FW5B12WG		4/18/14	19.11	NA	4.48	35.1	12.9	0.210	18.9	42 J	**4,900**	2.7	0.13 J	ND(0.1)	0.66	ND(0.2)	NA
	14FWOU516WG		10/28/14	16.71	NA	0.38	2.8	4.2	0.080	33.0	NA	**2,200**	1.6	ND(0.1)	ND(0.1)	0.38 J	ND(0.1)	NA
	NA		WELL WAS BROKEN - SAMPLE NOT COLLECTED															

Table 4-2 - WQFS Benzene Area Groundwater Monitoring Results

Probe/Well Number	Sample Numbers	Screened Interval (ft-bgs)	Date	Water Level (ft btoc)	Water Elevation (ft-msl)	Dissolved Oxygen (mg/L)	Redox (mV)	Dissolved Manganese (mg/L)	Dissolved Iron (mg/L)	Sulfate (mg/L)	ROD Contaminants of Concern							
											GRO (µg/L)	DRO (µg/L)	Benzene (µg/L)	Toluene (µg/L)	TCE (µg/L)	1,2-DCA (µg/L)	EDB by 8260C (µg/L)	EDB by 504.1 (µg/L)
ROD CLEANUP LEVELS (µg/L)											**2,200**	**1,500**	**5**	**1,000**	**5**	**5**	**0.05**	**0.05**
OU5-TW5	11FW5209WG	14-19	6/15/11	19.23	NA	0.72	-15.3	5.17	27.4	9.71	540	**9,000**	3.8 QH	0.48 J, QH	ND(0.5)	ND(0.5)	ND(2)	ND(0.0096)
	12FW5B06WG		8/28/12	19.36	NA	0.29	-81.3	4.51	13.6	9.60	480	**4,700 QL**	2.4 QL	0.27 J,QL	ND(0.1)QL	0.44 J,QL	ND(0.2)QL	NA
	13FW5B08WG		4/17/13	20.15	NA	0.3	-57.1	7.46	10.1	7.9	NA	**4,600**	2.2	0.26 J	ND(0.1)	0.63	ND(0.2)	NA
	14FW5B13WG		4/18/14	20.2	NA	0.35	-30.8	8.43	14.6	10.4	660	**4,200**	2.1	0.28 J	ND(0.1)	0.44 J	ND(0.2)	NA
	14FWOU514WG		10/28/14	17.76	NA	0.62	-37.7	7.32	38.4	51.8	NA	**8,500**	2.6	0.18 J	ND(0.1)	0.53	ND(0.2)	NA
	15FWOU524WG		5/20/15	18.3	NA	0.91	-39.1	6.54 J-	42.8 J-	18.3	NA	**7,900**	1.9	0.18 J	ND(0.1)	ND(0.15)	ND(1)	NA
OU5-TW6	11FW5213WG	14-24	9/14/11	17.28	NA	2.08	-3.0	15.2	57	0.99	2,000	**22,000**	**5.9**	9.1	0.67	ND(0.94)	ND(2)	ND(0.0095)
	11FW5214WG[1]							14.7	54	0.99	2,000	**23,000**	**5.9**	9	0.71	ND(0.97)	ND(2)	ND(0.0095)
	12FW5B03WG		8/28/12	18.48	NA	0.72	3.9	14.2	59	0.97	1,900	**18,000 QL**	5.0 QL	9.6 QL	0.67 QL	ND(1.2)QL	ND(0.2)	NA
	12FW5B04WG[1]							14	58	1.17	1,900	**16,000 QL**	5.0 QL	9.6 QL	0.59 QL	ND(1.3)QL	ND(0.2)QL	NA
	13FW5B01WG		4/16/13	19.25	NA	0.25	-95	11.3	46.4	0.85 MH	1,800	**9,100**	**5.4**	7.5	1.2	ND(1.3)	ND(0.4)	NA
	13FW5B02WG[1]							11.0	44.1	0.82	1,900	**8,600**	**5.5**	7.6	1.1	ND(1.2)	ND(0.4)	NA
	14FW5B09WG		4/18/14	19.32	NA	0.93	-51.8	10.7	53.2	0.31	**2,900**	**9,800**	**7.2**	9.7	0.7	1.8	ND(0.2)	NA
	14FW5B10WG[1]							10.5	53.1	0.29	**2,800**	**9,100**	**7.2**	9.6	0.7	1.7	ND(0.2)	NA
	14FWOU528WG		10/29/14	16.95	NA	0.49	-84.6	13.6	85.0	6.40	1,800	**23,000**	**5.8**	7.3	0.5	1.3	ND(0.2)	NA
	14FWOU530WG							13.4	84.7	6.30	1,800	**25,000**	**6**	7.5	0.45 J	1.4	ND(0.2)	NA
	15FWOU534WG		5/21/15	17.49	NA	0.27	-10.7	10.5	48.5	0.13 J	**2,300**	**9,100**	**7.5**	9.2	0.8	ND(0.15)	ND(0.2)	NA
	15FWOU535WG							10.2	47.1	0.1 J	**2,300**	**8,900**	**7.4**	9.2	0.8	ND(0.15)	ND(0.2)	NA
OU5-TW7	11FW5215WG	14-24	9/14/11	17.09	NA	1.39	-9.0	1.72	15.6	18.9	210	1,500	0.49 J	1.1	ND(0.5)	0.20 J	ND(2)	ND(0.0095)
	12FW5B02WG		8/28/12	18.28	NA	0.94	3.5	1.85	12.6	18.6	89 J,B	1,300 QL	0.36 J	0.39 J	0.10 J	0.22 J	ND(0.2)	NA
	13FW5B11WG		4/18/13	19.00	NA	0.21	-73.6	1.8	8.4	21.3	NA	650 J,QL	0.33 J	0.34 J	ND(0.1)	0.29 J	ND(0.2)	NA
	14FW5B08WG		4/18/14	19.02	NA	3.75	-43.9	2.0	13.1	19.4	95	**1,900**	0.43 J	0.7	0.10 J	ND(0.15)	ND(0.2)	NA
	14FWOU508WG		10/28/14	16.69	NA	0.67	31	1.9	18.6	13.9	NA	**2,600**	0.8	0.48 J	0.10 J	0.39 J	ND(0.2)	NA
	15FWOU536WG		5/21/15	17.24	NA	0.34	17.6	2.4	9.0	14.5	NA	**1,700**	1.5	0.23 J	ND(0.1)	0.46 J	ND(0.2)	NA
OU5-TW8	11FW5218WG	13.5-23.5	9/15/11	18.50	NA	1.75	-60.7	10.7	35.9	2.32	120	**24,000**	4.4	0.72	0.46 J	0.6	ND(2)	ND(0.0097)
	12FW5B09WG		8/28/12	19.60	NA	0.88	-56.8	11.4	34.1	4.7	130 B	**19,000 QL**	4.2	0.59	ND(0.1)	0.42 J	ND(0.2)	NA
	13FW5B10WG		4/18/13	20.36	NA	0.39	-68.1	11.1	23.2	6.4	NA	**16,000 QL**	4.3	0.37 J	0.12 J	0.45 J	ND(0.2)	NA
	14FW5B05WG		4/17/14	20.40	NA	0.59	-24	11.1	20.2	5.4	240	**11,000**	3.5	0.37 J	0.21 J	0.43 J	ND(0.2)	NA
	14FWOU522WG		10/29/14	18.03	NA	0.38	38.8	10.0	60.7	4.2	NA	**27,000**	4.2	0.62	0.15 J	0.57	ND(0.2)	NA
	15FWOU541WG		5/26/15	18.95	NA	0.36	30.5	13.8	39.2	0.18 J	NA	**19,000**	**7.2**	0.62	0.45 J	ND(0.15)	ND(0.2)	NA
OU5-TW9	11FW5216WG	12.5-22.5	9/14/11	16.32	NA	1.43	3.7	3.15	10.1 MH	21.4 MH	87 J	**3,500**	1.8	0.36 J, MH, B	ND(0.5)	0.39 J	ND(2)	ND(0.0097)
	12FW5B08WG		8/28/12	17.54	NA	0.11	-30.9	3.83	10.4	34.6	88 J,B	**2,100 QL**	1.8	0.2 J	ND(0.1)	0.51	ND(0.2)	NA
	13FW5B12WG		4/18/13	18.30	NA	0.25	-63.2	5.4	18.8	20.1	NA	**4,800 QL**	2.5	0.29 J	ND(0.1)	0.84	ND(0.2)	NA
	14FW5B07WG		4/18/14	18.28	NA	2.01	-27.8	4.9	11.0	34.7	120	**2,300**	2.1	0.2 J	ND(0.1)	0.73	ND(0.2)	NA
	14FWOU512WG		10/28/14	15.95	NA	0.37	7	4.6	4.6	12.9	NA	**2,800**	1.9	0.080 J	ND(0.1)	0.5	ND(0.1)	NA
	15FWOU528WG		5/20/15	16.44	NA	0.69	-19.1	6.0	9.8	17.1	NA	**8,700**	2.4	0.12 J	ND(0.1)	0.74	ND(0.2)	NA

Table 4-2 - WQFS Benzene Area Groundwater Monitoring Results

Probe/Well Number	Sample Numbers	Screened Interval (ft-bgs)	Date	Water Level (ft btoc)	Water Elevation (ft-msl)	Dissolved Oxygen (mg/L)	Redox (mV)	Dissolved Manganese (mg/L)	Dissolved Iron (mg/L)	Sulfate (mg/L)	ROD Contaminants of Concern: GRO (µg/L)	DRO (µg/L)	Benzene (µg/L)	Toluene (µg/L)	TCE (µg/L)	1,2-DCA (µg/L)	EDB by 8260C (µg/L)	EDB by 504.1 (µg/L)
ROD CLEANUP LEVELS (µg/L)											**2,200**	**1,500**	**5**	**1,000**	**5**	**5**	**0.05**	**0.05**
OU5-TW10	11FW5217WG	14-24	9/15/11	17.47	NA	1.66	-52.8	11.40	16.4	3.24	560	**10,000**	5.0	1.4	0.59	0.54	ND(2)	0.016
	12FW5B01WG		8/27/12	18.73	NA	0.61	-41	10.3	15	2.8	500	**11,000 QL**	3.7	0.64	0.44 J	0.54	ND(0.2)	NA
	13FW5B09WG		4/18/13	19.38	NA	0.23	-52.4	6.83	7.08	5.97	NA	**3,800 QL**	3.0 QH	0.45 J,QH	0.35 J,QH	0.71,QH	ND(0.2)	NA
	14FW5B04WG		4/17/18	19.36	NA	0.51	-18.6	8.38	8.69	7.13	750	**4,400**	2.9	0.61	0.44 J	0.91	ND(0.2)	NA
	14FWOU524WG		10/29/14	17.06	NA	0.73	-3.8	14.1	36.8	0.24	NA	**34,000**	**6.3**	1.7	0.58	1.1	ND(0.2)	NA
	15FWOU538WG		5/21/15	17.59	NA	0.25	32.9	16.0	20.1	0.64	NA	**24,000**	**6.8**	3.7	0.9	ND(0.15)	ND(0.2)	NA

Notes:

Bold data is greater than the ADEC and/or ROD action levels

Yellow highlighting indicates the water level was above the well screen at the time of the sampling event, for wells not intended to be screened below the water table

[1] Sample is a Field Duplicate of the sample immediately above.

[2] OU5-TW1 was replaced by AP-10260MW in October 2013

Acronyms:

bgs - below ground surface
btoc - below top of casing
1,2-DCA - 1,2-dichloroethane
DRO - diesel range organics
EDB - 1,2-dibromoethane
ft - feet
GRO - gasoline range organics
LOD - limit of detection
LOQ - limit of quantitation
msl - mean sea level
µg/L - micrograms per liter
mg/L - milligrams per liter
mV - millivolts
NA - not analyzed or not applicable
NM - not measured
QC - quality control
ROD - Record of Decision
TOC - top of casing

Data Qualifiers

ND - Not detected at the detection limit (LOD in parentheses; LOQ in parentheses for data prior to 2012.)
B - Result is qualified as a potential high estimate due to contamination present in a blank sample
J - Result is estimated due to a QC issue or because it is less than the LOQ. If result is biased low or high, it is specified as "J-" and "J+", respectively (for 2014 data and later).
Q - Result is estimated due to a QC failure (pre-2014 data only). If direction of bias is known, it is further indicated with a "L" (low) or "H" (high).
M - Result is biased due to matrix interference (pre-2014 data only). If direction of bias is known, it is further indicated with a "L" (low) or "H" (high).

Table 4-3 - WQFS DRO Plume Groundwater Monitoring Results

Probe/Well Number	Sample Numbers	Screened Interval (ft-bgs)	Date	Water Elevation (ft-msl)	Dissolved Oxygen (mg/L)	Redox (mV)	Dissolved Manganese (mg/L)	Dissolved Iron (mg/L)	Sulfate (mg/L)	ROD Contaminants of Concern GRO (µg/L)	DRO (µg/L)	Benzene (µg/L)	Toluene (µg/L)	TCE (µg/L)	1,2-DCA (µg/L)	EDB by 8260C (µg/L)	EDB by 504.1 (µg/L)
ROD CLEANUP LEVELS (µg/L)										**2,200**	**1,500**	**5**	**1,000**	**5**	**5**	**0.05**	**0.05**
AP-5974	11FW5203WG	13-23	6/15/11	434.75	0.78	-28.9	6.82	55.8	0.23 J	**2,600**	**15,000**	1.8 QH	7.2 QH	1.4 QH	ND(0.91)	ND(2)	0.014
	12FW5D04WG		8/31/12	435.15	0.16	-72.9	5.39	57.3	0.37	1,600	**5,200 QL**	2.0 J,QL	8.4 QL	1.0 QL	ND(0.96)QL	ND(0.2)QL	0.0079 J
	13FW5D02WG		4/17/13	433.97	0.24	-75.9	3.77	47.8	0.28	2,200	**3,900**	1.1 Q	4.3 Q	1.1 Q	0.84 Q	ND(0.2)Q	NA
	14FWOU511WG		10/28/14	436.25	0.38	-58.9	18.00	59.1	4.10	1,600	**15,000**	**7.8**	1.0	0.83	2.0	ND(0.2)	NA
	15FWOU533WG		5/21/15	435.62	0.31	22.2	9.55	60.9	0.18 J	1,500	**6,900**	3.9	3.3	1.0	ND(0.15)	ND(0.2)	NA
AP-5975	11FW5305WG	13-23	6/10/11	434.15	1.03	74.1	0.0941	ND(0.018)	51.5	40 J	**2,900**	0.23 J	0.33 J	ND(0.5)	ND(0.5)	ND(2)	NA
	12FW5D02WG		8/28/12	434.14	0.23	-20.1	1.31	2.25	15.7	230	**4,500 QL**	2.2	0.57	ND(0.1)	ND(0.15)	ND(0.2)	NA
	13FW5D09WG		4/22/13	433.41	0.2	-40.7	2.01	7.69	14.2	NA	**4,300**	2.9	0.38 J	ND(0.1)	0.27 J	ND(0.2)	NA
	14FWOU515WG		10/28/14	435.91	0.45	21.1	2.91	2.11	28.5	NA	**5,300**	2.1	0.43 J	ND(0.1)	0.24 J	ND(0.2)	NA
	15FWOU519WG		5/19/15	435.17	0.54	81.6	3.11	3.94	36.1	NA	**3,500**	1.4	0.21 J	ND(0.1)	0.16 J	ND(0.2)	NA
AP-6887	11FW5402WG	9.5-27.5	6/13/11	435.02	0.71	-28	0.491 Q	1.66 Q	25.9	ND(100)	140 J	0.070 J	0.18 J, Q	0.13 J	ND(0.5)	ND(2)	NA
	11FW5403WG[1]						1.14	6.15	26.7	ND(100)	110 J	0.070 J	0.29 J	0.15 J	ND(0.5)	ND(2)	NA
	12FW5D03WG		8/28/12	434.91	0.16	38.5	0.82	0.21	30	ND(25)	48 J,QL,ML	ND(0.1)	0.2 J	0.17 J	ND(0.15)	ND(0.2)ML	NA
	13FW5D08WG		4/22/13	434.17	0.2	72.2	0.852	0.176	31.1 MH	NA	420 J,ML	ND(0.1)	ND(0.1)	0.16 J,MH	ND(0.15)	ND(0.2)	NA
	14FWOU506WG		10/28/14	436.44	0.7	146.7	1.160	0.053	55.2	NA	**1,500**	ND(0.1)	0.080 J	0.15 J	ND(0.15)	ND(0.1)	NA
	15FWOU517WG		5/19/15	436.10	0.4	113.6	0.705	0.092	37.7	NA	86 J,B	ND(0.1)	ND(0.1)	0.13 J	ND(0.15)	ND(0.2)	NA
AP-6888	11FW5103WG	12-27.5	6/14/11	434.55	3.1	-45.4	4.27	18.1	9.86	230	**2,800**	2.1	0.29 J	ND(0.5)	ND(0.5)	ND(2)	ND(0.0096)
	12FW5D05WG		8/31/12	435.37	0.55	-76.3	4.65	20.9	6.40	390	**2,300 QL**	2.2	0.49 J,B	0.24 J	ND(0.17)	ND(0.2)	ND(0.004)
	12FW5D06WG		8/31/12	435.37	0.55	-76.3	4.77	21.1	6.30	390	**2,200 QL**	2.2	0.53 B	0.18 J	ND(0.5)	ND(0.2)	ND(0.004)
	13FW5D03WG		4/18/13	434.10	0.22	-66.4	4.39	19.7	13.1	NA	**1,900 QL**	1.7	0.22 J	0.14 J,Q	0.16 J	ND(0.2)	NA
	13FW5D04WG[1]						4.42	19.8	12.2	NA	**1,900 QL**	1.6	0.22	ND(0.1)Q	0.17 J	ND(0.2)	NA
	14FWOU502WG		10/27/14	436.16	0.54	5.4	5.38	18.1	8.2	NA	**2,200**	2.0	0.74	0.23 J	ND(0.5)	ND(0.2)	NA
	14FWOU503WG						5.40	18.4	7.6	NA	**2,400**	2.0	0.75	ND(0.25)	0.18 J	ND(0.2)	NA
	15FWOU515WG		5/18/15	436.11	0.20	3.7	4.61	22.1	16.3	NA	**2,000**	1.0 J,J-	0.11 J	ND(0.1)	ND(0.15)	ND(0.2) J-	NA
	15FWOU516WG[1]						4.64	22.2	16.5	NA	**1,600**	1.0 J,J-	0.12 J	ND(0.1)	ND(0.15)	ND(0.2) J-	NA
AP-6889	11FW5102WG	11.5-21.5	6/14/11	429.17	2.8	-19.8	1.29	6.28	21.80	26 J	140 J	0.7	0.12	ND(0.5)	ND(0.5)	ND(2)	ND(0.0095)
	12FW5D12WG		9/3/12	429.62	0.31	-68.2	1.31	7.08	21.70	26 J,B	130 J,QL	0.6	0.080 J,B	ND(0.1)	ND(0.15)	ND(0.2)	ND(0.004)
	13FW5D11WG		4/23/13	428.29	0.2	-71.5	1.43	7.63	25.4	NA	200 J	0.5	ND(0.1)	ND(0.1)	ND(0.15)	ND(0.2)	NA
	14FWOU513WG		10/28/14	430.77	0.4	-44.9	1.86	9.02	7.1	NA	170 J	0.5	0.060 J	ND(0.1)	ND(0.15)	ND(0.1)	NA
	15FWOU520WG		5/20/15	430.21	0.4	68.7	1.82	8.45	25.4	NA	200 J	0.38 J	ND(0.1)	ND(0.1)	ND(0.15)	ND(0.2)	NA
AP-7742	10FW5204WG	16-21	7/20/10	434.36	0.28	-109.80	NA	NA	NA	1,500 Y	**3,000 QL**	3.9	1.8	ND(0.5)	0.82	ND(2)	ND(0.0097)
	11FW5202WG		6/10/11	434.33	0.67	-20.50	2.53	8.89	37.5	1,800	**7,200 MH**	2.7 QH	6.1 QH	ND(0.5)	ND(0.59)	ND(2)	NA
	12FW5D01WG		8/28/12	434.34	0.2	-89.9	3.62	13.4	9.40	1,300	**4,100 QL**	2.1 QL	1.4 QL	0.29 J,QL	ND(0.59)QL	ND(0.2)QL	NA
	13FW5D10WG		4/23/13	433.72	0.3	-98.9	3.99	13.8	4.04	NA	**2,900**	1.8 Q	1.3 Q	ND(0.1)Q	0.77 Q	ND(0.2)Q	NA
	14FWOU501WG		10/27/14	435.84	0.5	23.7	3.60	9.44	76.30	NA	**4,600**	1.6	1.4	ND(0.25)	0.48 J	ND(0.2)	NA
	15FWOU513WG		5/18/15	435.40	0.3	15.5	4.78	16.8	72.90	NA	**4,200**	1.5	6.2	ND(0.1)	ND(0.15)	ND(1.0)	NA

Table 4-3 - WQFS DRO Plume Groundwater Monitoring Results

Probe/Well Number	Sample Numbers	Screened Interval (ft-bgs)	Date	Water Elevation (ft-msl)	Dissolved Oxygen (mg/L)	Redox (mV)	Dissolved Manganese (mg/L)	Dissolved Iron (mg/L)	Sulfate (mg/L)	ROD Contaminants of Concern							
										GRO (µg/L)	DRO (µg/L)	Benzene (µg/L)	Toluene (µg/L)	TCE (µg/L)	1,2-DCA (µg/L)	EDB by 8260C (µg/L)	EDB by 504.1 (µg/L)
ROD CLEANUP LEVELS (µg/L)										2,200	1,500	5	1,000	5	5	0.05	0.05
AP-8064		12-22	5/27/05	430.89	NA		NA	NA	NA	93.8	**18,700**	ND(0.4)	0.40 J	ND(1)	ND(0.5)	ND(1)	**0.415**
	05FWSA005WA		10/20/05	430.17	1.13		NA	NA	NA	106	**6,410**	ND(0.4)	0.350 J	ND(1)	ND(0.5)	ND(1)	ND(0.0188)
	06FWFP201WA		6/20/06	429.77	0.55		3.50	5.60	72.8	370	**7,800 Q**	0.95 J	1.2	ND(1)	0.086 J	ND(1)	0.033
	06FWFP211WA		10/5/06	429.92	0.83		4.20 J	7.30 J	9.33 J	280 Q	**8,500 Q**	**6.4 Q**	1.2 Q	ND(1) Q	0.34 Q	ND(1) Q	0.013 Q
	07FWFP201WG		5/28/07	429.33	0.81	-13.6	9.43	8.26	5.30	650	**15,000**	4.1	1.9	0.96	ND(0.5)	ND(2)	**0.05**
	07FWFP211WG		10/2/07	430.25	0.62	-60.2	7.38	10.30	2.80	770	**9,500 Q**	4.0	1.8	1.3	ND(0.5)	ND(2)	**0.05**
	08FW5206WG		5/22/08	430.34	0.72	-50.7	NA	NA	NA	530	**6,400**	2.2	1.5	1.2	ND(0.5)	ND(2)	0.016
	08FW5214WG		9/12/08	430.74	0.27	57.8	NA	NA	NA	690	**41,000**	1.5	3.3	0.53	ND(0.5)	ND(2)	**0.17**
	09FW5202WG		6/16/09	429.93	0.64	-54.7	NA	NA	NA	930	**19,000**	2.9	3.5	1.2	0.58	ND(2)	**0.05**
	09FW5208WG		9/16/09	430.42	0.61	-49.7	NA	NA	NA	1,100 Y	**9,100**	4.2	4.3	ND(1.3)	0.66	ND(2)	0.02
	10FW5202WG		7/20/10	434.60	0.73	-57.4	NA	NA	NA	1,600 Y	**8,400 QL**	3.4	4.6	0.84	0.75	ND(2)	ND(0.0097)
AP-8064	11FW5208WG	12-22	6/15/11	434.68	0.7	-22.8	9.97	33.2	2.93	1,800	**14,000**	3.7	4.1	0.66	0.78	ND(2)	0.0044 J
	12FW5D07WG		8/31/12	435.13	0.1	-93.4	7.21	43.3	0.31	1,800	**7,300 QL**	**5.4 QL**	12 QL	0.84 QL	ND(1.4)QL	ND(0.2)QL	ND(0.004)
	13FW5D01WG		4/16/13	433.94	0.1	-65.6	7.4	55.2	0.47	1,700	**9,800**	**6.4**	13	1.1	ND(1.1)	ND(0.2)	NA
	14FWOU504WG		10/27/14	436.07	0.7	-102.4	17.0	91.7	29.20	1,100	**49,000**	3.6	2.2	ND(0.5)	1.2	ND(0.2)	NA
	15FWOU532WG		5/21/15	435.75	0.2	23.1	7.8	55.0	0.30	1,700	**6,300**	**6.2**	12	0.71	ND(0.15)	ND(0.2)	NA
AP-8065	11FW5307WG	13-33	6/15/11	434.55	0.63	-31.6	6.11	68.2	3.01	980	**21,000**	3.8	2.8	0.16 J	0.28 J	ND(2)	ND(0.0095)
	12FW5D10WG		8/31/12	435.22	0.11	-88.7	5.02	60.3	6	830	**11,000 QL**	2.4 QL	2.7 QL	0.18 J,QL	ND(0.22)QL	ND(0.2)QL	ND(0.004)
	13FW5D06WG		4/22/13	434.32	0.2	-88.2	4.3	43.7	5.63	NA	**6,800**	2.6 MH,Q	3.3 MH,Q	0.19 J,MH,Q	ND(0.15)Q	ND(0.2)ML,Q	NA
	14FWOU509WG		10/28/14	436.35	0.3	-61.1	4.9	98.2	2.70	NA	**27,000**	1.8	1.5	0.23 J	ND(0.15)	ND(0.2)	NA
	15FWOU514WG		5/18/15	436.10	0.2	1.6	4.2	49.7	7.40	NA	**5,900**	1.7	1.5	ND(0.1)	0.17 J	ND(0.2)	NA
AP-8066	11FW5404WG	12.5-22.5	6/14/11	434.74	0.85	-6.60	1.90	11.3	19.6	44 J	**3,800**	0.16 J	0.21 J	0.33 J	ND(0.5)	ND(2)	ND(0.0097)
	12FW5D09WG		8/31/12	435.41	0.14	-69.30	1.77	14.1	18.2	40 J,B	**2,100 QL**	0.12 J	0.15 J,B	0.31 J	ND(0.5)	ND(0.2)	ND(0.004)
	13FW5D07WG		4/22/13	434.20	0.2	-66.2	1.74	15.3	20.5	NA	1,300	0.14 J	0.22 J	0.30 J	ND(0.15)	ND(0.2)	NA
	14FWOU505WG		10/27/14	436.38	0.5	-101.1	12.20	61.1	10.4	NA	**31,000**	0.9	1.1	0.29 J	0.12 J	ND(0.2)	NA
	15FWOU518WG		5/19/15	436.15	0.2	51.3	3.45	21.7	18.3	NA	**1,800**	0.4	0.6	0.26 J	ND(0.15)	ND(0.2)	NA
AP-10043MW[3]	11FW5405WG	13.5-23.5	6/14/11	434.57	0.53	-34.7	6.77	20.7	27.2	74 J	**25,000**	1.7	0.61	ND(0.5)	ND(0.5)	ND(2)	ND(0.0097)
	11FW5406WG-A[1,2]						6.65	20.4	25.7	72 J	**23,000**	2.0	0.70	ND(0.5)	0.2 J	ND(2)	ND(0.0094)
	12FW5D11WG		9/3/12	435.03	0.29	-77.5	6.4	23.9	9.7	45 J,B	**11,000**	1.3	0.39 J,B	ND(0.1)	0.08 J	ND(0.2)	ND(0.004)
	13FW5D05WG		4/22/13	433.82	0.17	-75.3	8.18	31.5	9.29	NA	**19,000**	1.7	0.59	ND(0.1)	0.14 J	ND(0.2)	NA
	14FWOU507WG		10/28/14	436.23	0.52	-23.5	23.3	88.2	4.8	NA	**49,000**	1.2	0.76	ND(0.1)	0.13 J	ND(0.2)	NA
	15FWOU512WG		5/18/15	435.83	0.29	23.4	12.6	50.3	69.5	NA	**13,000**	0.94	0.63	ND(0.1)	0.08 J	ND(0.2)	NA

Notes:

Bold data is greater than the ADEC and/or ROD action levels

Yellow highlighting indicates the water level was above the well screen at the time of the sampling event, for wells not intended to be screened below the water table

1 Sample is a Field Duplicate of the sample immediately above.

2 Sample IDs 11FW5406WG was inadvertantly duplicated. The sample ID was amended with "A" for clarification

3 AP-10043MW replaced AP-7648 and was installed in July 2010. AP-7648 was screened from 19-24 feet bgs

Acronyms:

bgs - below ground surface
btoc - below top of casing
1,2-DCA - 1,2-dichloroethane
DRO - diesel range organics
EDB - 1,2-dibromoethane
ft - feet
GRO - gasoline range organics
LOD - limit of detection
LOQ - limit of quantitation
msl - mean sea level
µg/L - micrograms per liter
mg/L - milligrams per liter
mV - millivolts
NA - not analyzed or not applicable
NM - not measured
QC - quality control
ROD - Record of Decision
TOC - top of casing

Data Qualifiers

ND - Not detected at the detection limit (LOD in parentheses; LOQ in parentheses for data prior to 2012.)
B - Result is qualified as a potential high estimate due to contamination present in a blank sample
J - Result is estimated due to a QC issue or because it is less than the LOQ. If result is biased low or high, it is specified as J- and "J+", respectively (for 2014 data and later).
Q - Result is estimated due to a QC failure (pre-2014 data only). If direction of bias is known, it is further indicated with a L (low) or "H" (high).
M - Result is biased due to matrix interference (pre-2014 data only). If direction of bias is known, it is further indicated with a "L" (low) or "H" (high).

Table 4-4 - Chena River Wells Groundwater Monitoring Results

Probe/Well Number	Sample Numbers	Screened Interval (ft-bgs)	Date	Water Elevation (ft-msl)	Dissolved Oxygen (mg/L)	Redox (mV)	Dissolved Manganese (mg/L)	Dissolved Iron (mg/L)	Sulfate (mg/L)	ROD Contaminants of Concern								AWQS	
										GRO (µg/L)	DRO (µg/L)	Benzene (µg/L)	Toluene (µg/L)	TCE (µg/L)	1,2-DCA (µg/L)	EDB by 8260C (µg/L)	EDB by 504.1 (µg/L)	TAH (µg/L)	TAqH (µg/L)
ROD CLEANUP LEVELS (µg/L)										2,200	1,500	5	1,000	5	5	0.05	0.05	10	15
AP-6882	11FW5302WG	10-27	6/8/11	433.90	0.74	-58.9	0.74	0.56	23.5	48 J	660 J	0.68	0.49 J	0.29 J	0.08 J	ND(2)	ND(0.0098)	1.8	1.9
	11FW5303WG[1]						0.65	4.16	23.5	46 J	590 J	0.67	0.52	0.32 J	0.08 J	ND(2)	ND(0.0096)	1.8	1.9
	11FW5308WG		9/13/11	435.16	1.42	15.8	NA	NA	NA	40 J	950	0.56	1.8	0.26 J	ND(0.5)	ND(2)	NA	2.8	3.0
	12FW5C04WG		9/3/12	434.49	0.14	-81.3	1.5	7.62	19.7	53 J,B	840 QL	0.69	0.08 J,B	0.29 J	0.08 J	ND(0.2)	ND(0.004)	1.2	NA
	12FW5C05WG[1]						1.48	7.41	19.7	55 J,B	860 QL	0.72	0.08 J,B	0.32 J	0.08 J	ND(0.2)	ND(0.004)	1.2	NA
	13FW5C03WG		4/22/2013	433.33	0.2	9.0	1.39	6.38	21.5	NA	700 J	0.74	0.09 J	0.29 J	0.11 J,Q	ND(0.2)	NA	1.3	NA
	13FW5C04WG[1]						1.4	6.48	21.9	NA	760 J	0.8	0.08 J,B	0.25 J	ND(0.15)Q	ND(0.2)	NA	1.4	NA
	14FWOU537WG		10/30/2014	435.74	1.07	19.3	1.39	5.53	27.5	NA	840 J	0.37 J	0.13 J	0.25 J	ND(0.15)	ND(0.2)	NA	0.9	NA
	14FWOU538WG[1]						1.38	5.57	27.6	NA	870	0.36 J	0.10 J	0.24 J	ND(0.15)	ND(0.2)	NA	1.0	NA
	15FWOU522WG		5/20/2015	435.05	0.36	74.5	1.36	5.5	23.9	NA	350 J	0.30 J	0.07 J	0.30 J	ND(0.15)	ND(0.2)	NA	0.7	NA
	15FWOU523WG[1]						1.35	5.44	23.7	NA	350 J	0.31 J	ND(0.1)	0.30 J	ND(0.15)	ND(0.2)	NA	0.7	NA
AP-6892	11FW5101WG	7.5-22.5	6/8/11	433.58	3.7	186.2	0.40	1.47	20.4	ND(100)	66 J	0.11 J	0.58	ND(0.5)	ND(0.5)	ND(2)	ND(0.0096)	1.1	1.2
	11FW5104WG		9/14/11	434.91	1.4	22.1	NA	NA	NA	17 J	180 J	0.21 J	0.21 J	ND(0.5)	ND(0.5)	ND(2)	NA	0.90	0.99
	12FW5C02WG		8/31/12	434.30	0.25	49.6	1.06	0.63	20.8	19 J,B	110 J,B,QL	ND(0.1)	0.10 J,B	ND(0.1)	ND(0.15)	ND(0.2)	ND(0.004)	0.7	NA
	13FW5C06WG		4/23/13	432.92	0.46	21.1	0.74	0.4	23.2	NA	140 J	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.15)	ND(0.2)	NA	0.7	NA
	14FWOU541WG		10/30/14	435.50	0.34	29.5	0.57	0.018 J	22.2	NA	130 J	ND(0.1)	0.08 J	ND(0.1)	ND(0.15)	ND(0.2)	NA	0.7	NA
	15FWOU529WG		5/20/15	434.78	0.45	86.9	0.88	0.45	22.6	NA	180 J	0.07 J	ND(0.1)	ND(0.1)	ND(0.15)	ND(0.2)	NA	0.5	NA
AP-6893	11FW5401WG	11-28	6/9/11	433.83	2.25	-36.5	0.994	4.72	25.2	ND(100)	170 J	0.12 J	0.17 J	0.27 J	ND(0.5)	ND(2)	ND(0.0095)	1.8	2.2
	11FW5406WG-B[2]		9/13/11	435.07	1.18	16	NA	NA	NA	ND(100)	130 J, Q	0.080 J	0.31 J, Q	0.37 J	ND(0.5)	ND(2)	NA	1.5	1.8
	11FW5407WG[1]						NA	NA	NA	ND(100)	200 J	0.080 J	0.88	0.37 J	ND(0.5)	ND(2)	NA	1.5	1.8
	12FW5C03WG		9/3/12	434.42	0.18	-47.6	0.39	1.21	21.7	15 J,B	290 J,QL	0.19 J	0.06 J,B	0.36 J	ND(0.15)	ND(0.2)	ND(0.004)	0.8	NA
	13FW5C01WG		4/22/13	433.27	0.19	41.7	0.249	2.57	23.7	NA	650 J	0.19 J	0.06 J,B	0.27 J	ND(0.15)	ND(0.2)	NA	0.8	NA
	14FWOU536WG		10/30/14	435.75	0.36	-6.8	0.922	1.58	22.3	NA	130 J	ND(0.1)	0.10 J	0.40 J	ND(0.15)	ND(0.2)	NA	0.7	NA
	15FWOU521WG		5/20/15	434.85	0.55	70.5	1.37	1.86	23.9	NA	220 J	0.07 J	0.06 J	0.34 J	ND(0.15)	ND(0.2)	NA	0.4	NA
AP-7832S	11FW5304WG	32-37	6/9/11	434.02	1.16	-73.9	0.9	10.2	24.4	ND(100)	36 J	0.22 J	0.13 J	0.55	ND(0.5)	ND(2)	ND(0.0096)	0.8	0.9
	11FW5309WG		9/13/11	435.20	1.25	11.2	NA	NA	NA	ND(100)	91 J	0.22 J	4.7	0.53	ND(0.5)	ND(2)	NA	5.6	5.7
	12FW5C06WG		9/3/12	434.55	0.21	-81	0.91	3.18	21.9	14 J,B	55 J,B,QL	0.20 J	0.08 J,B	0.59	ND(0.15)	ND(0.2)	ND(0.004)	0.78	NA
	13FW5C05WG		4/22/13	433.33	0.23	-8.9	0.913	3.1	24.6	NA	270 J	0.25 J	0.06 J	0.6	ND(0.15)	ND(0.2)	NA	0.8	NA
	14FWOU539WG		10/30/14	435.79	0.3	-34.4	0.99	2.95	21.4	NA	87 J	0.17 J	0.14 J	0.51	ND(0.15)	ND(0.2)	NA	NA	NA
	15FWOU525WG		5/20/15	435.14	0.9	72.7	0.84	2.39	25.1	NA	92 J,B	0.14 J	0.07 J	0.46 J	ND(0.15)	ND(0.2)	NA	0.5	NA

Table 4-4 - Chena River Wells Groundwater Monitoring Results

Probe/Well Number	Sample Numbers	Screened Interval (ft-bgs)	Date	Water Elevation (ft-msl)	Dissolved Oxygen (mg/L)	Redox (mV)	Dissolved Manganese (mg/L)	Dissolved Iron (mg/L)	Sulfate (mg/L)	ROD Contaminants of Concern								AWQS	
										GRO (µg/L)	DRO (µg/L)	Benzene (µg/L)	Toluene (µg/L)	TCE (µg/L)	1,2-DCA (µg/L)	EDB by 8260C (µg/L)	EDB by 504.1 (µg/L)	TAH (µg/L)	TAqH (µg/L)
ROD CLEANUP LEVELS (µg/L)										**2,200**	**1,500**	**5**	**1,000**	**5**	**5**	**0.05**	**0.05**	**10**	**15**
AP-7838	11FW5201WG	14-24	6/8/11	433.68	1.16	105.4	0.482	0.39	27.6	16 J	190 J	0.26 J	0.55	ND(0.5)	ND(0.5)	ND(2)	ND(0.0097)	1.6	1.9
	11FW5212WG		9/14/11	435.02	1.25	11.2	NA	NA	NA	NA	NA	0.40 J	0.29 J	ND(0.5)	0.12 J	ND(2)	NA	1.4	1.8
	12FW5C01WG		8/31/12	434.39	0.77	78.2	0.611	1.74	54.0	26 J,B	230 J,QL	0.16 J	0.08 J,B	0.10 J	ND(0.15)	ND(0.2)	ND(0.004)	0.7	NA
	13FW5C02WG		4/22/13	433.08	0.35	75.2	1.66	4.78	41.1	NA	320 J	0.32 J	0.09 J	ND(0.1)	0.1 J	ND(0.2)	NA	0.9	NA
	14FWOU540WG		10/30/14	435.68	0.79	16.4	1.48	2.08	29.5	NA	270 J	0.35 J	0.12 J	ND(0.1)	ND(0.15)	ND(0.2)	NA	1.0	NA
	15FWOU527WG		5/20/15	434.88	0.35	80.8	1.13	2.93	29.7	NA	260 J	0.48 J	0.09 J	0.12 J	0.12 J	ND(0.2)	NA	0.9	NA

Notes:

Bold data is greater than the ADEC and/or ROD action levels

[1] Sample is a Field Duplicate of the sample immediately above.

[2] Sample ID 11FW5406 was inadvertantly duplicated. The sample ID was amended with "B" for clarification.

TAH and TAqH were calculated based on the sum of detections and the sum of the LOD for non-detect results. TAH is a summation of BTEX concentrations, and TAqH is a summation of BTEX and PAH compound results

Acronyms:

AWQS - Alaska Water Quality Standard
bgs - below ground surface
btoc - below top of casing
1,2-DCA - 1,2-dichloroethane
DRO - diesel range organics
EDB - 1,2-dibromoethane
ft - feet
GRO - gasoline range organics
LOD - limit of detection
LOQ - limit of quantitation
msl - mean sea level
µg/L - micrograms per liter
mg/L - milligrams per liter
mV - millivolts
NA - not analyzed or not applicable
NM - not measured
QC - quality control
ROD - Record of Decision
TAH - total aromatic hydrocarbons
TAqH - total aqueous hydrocarbons
TOC - top of casing

Data Qualifiers

ND - Not detected at the detection limit (LOD in parentheses; LOQ in parentheses for data prior to 2012.)
B - Result is qualified as a potential high estimate due to contamination present in a blank sample
J - Result is estimated due to a QC issue or because it is less than the LOQ. If result is biased low or high, it is specified as "J-" and "J+", respectively (for 2014 data and later).
Q - Result is estimated due to a QC failure (pre-2014 data only). If direction of bias is known, it is further indicated with a "L" (low) or "H" (high).
M - Result is biased due to matrix interference (pre-2014 data only). If direction of bias is known, it is further indicated with a "L" (low) or "H" (high).

NOTES:

1. Due to space limitations, analytical data for only one sample event per year between 1999 and 2011 is shown. Spring / summer data is shown over fall / winter data because concentrations are generally higher.
2. TAH for 2012 and 2013 are calculated using LOD for analytes not detected. PAH analysis was eliminated from the monitoring program in 2012.
3. The Source Area and Horizontal Well treatment systems were shutdown in November 2005 to conduct a contaminant rebound study, and were decommissioned in 2011.
4. The WQFS3 Zone was shutdown in March 2003 to conduct a contaminant rebound study.
5. Cleanup levels for GRO changed from 1,300 ug/L to 2,200 ug/L in October 2008.
6. Groundwater elevations are shown in either NAVD-88 or NGVD-29 datums. A comprehensive survey of the monitoring wells in the groundwater sampling program occured in the summer of 2010. All Elevations after July 2010 are in NAVD-88.
7. 2010 Groundwater elevations are shown NAVD-88 for both monitoring events.
8. AP-7648 was replaced by AP-10043 in 2010.
9. ISCO injection in the vicinity of OU5-TW1 was completed in September/October 2012 using Regenesis RegenOx and in October 2013 using Klozur CR.
10. GRO analysis was discontinued in all wells except AP-7455S, OU5-TW1, AP-5974, and AP-8064 starting in 2013.

KEY:

Well number
Sampling Date
Screened interval (feet bgs)
Groundwater elevation in feet (ft) above sea level NGVD-29 or NAVD-88
Concentration in in ug/L

AP-6882 10 - 27	Sep-94	Sep-95	June-06	Oct-06	May-07
GW EL.	434.32	437.89	428.86	429.14	428.55
DRO	930	2,450	540	700	440
GRO	1,200	1,210	54	24	51
BENZENE	280	110	0.78	0.85	0.78
TOLUENE	5.8	ND(5)	0.062	0.13	0.14
TCE	1.0	ND(5)	0.26	0.21	0.21
1,2-DCA	9.7	4	ND(1)	ND(1)	ND(0.5)
EDB	NR	NA	ND(0.02)	ND(0.02)	ND(0.0097)
TAH			2.4	2.0	1.7
TAqH			3.2	2.8	1.9

Concentrations exceeding RAOs shown in blue.

LEGEND:

AP-7662 SPARGE CURTAIN MONITORING WELL
OU5-TW4 WQFS BENZENE PLUME TEMPORARY WELL
AP-7455S WQFS MONITORING WELL
AP-6893 CHENA RIVER MONITORING WELL
AP-6888 DRO PLUME MONITORING WELL
APPROXIMATE DRO PLUME
APPROXIMATE BENZENE PLUME
APPROXIMATE ISCO INJECTION GRID
INTACT TREATMENT SYSTEM
DECOMMISSIONED TREATMENT SYSTEM

ACRONYMS:

1,2-DCA	1,2-Dichloroethane	NA	Not analyzed
EDB	1,2-Dibromoethane	ND(4)	Not detected (LOD)
GRO	Gasoline Range Organics	NM	Not measured
DRO	Diesel Range Organics	NR	Not reported
TAH	Total Aromatic Hydrocarbons	NS	Not sampled, well damaged
TAqH	Total Aqueous Hydrocarbons	R	Data rejected
TCE	Trichloroethene	RAO	Remedial Action Objective
ICSO	In-situ Chemical Oxidation	RG	Remedial Goal
LOD	Limit of Detection	(*)	Detection limit not reported
		--	Not Calculated

Contaminant of Concern	RG µg/L
DRO	1,500
GRO	2,200
BENZENE	5
TOLUENE	1,000
TCE	5
1,2-DCA	5
EDB	0.05
TAH	10
TAqH	15

0 10 20 40
SCALE IN METERS

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

WQFS Groundwater Contaminant Concentrations

2015 Monitoring Report
Operable Unit 5
Fort Wainwright, Alaska

CONTRACT: W911KB-12-D-0001 | FIGURE: 4-1 | DATE: 8/16

1959AF

Benzene Concentrations at WQFS

1994 | 1999 | 2003 | 2008 | 2015

GRO Concentrations at WQFS

1994 | 1999 | 2003 | 2008 | 2015

DRO Concentrations at WQFS

1994 | 1999 | 2003 | 2008 | 2015

NOTES:

1. Highest yearly concentrations shown on map.
2. Previous years contaminant plumes modified based on new monitoring well points and reevaluation of past data.
3. Drawings are conceptual and are based on evaluation of available information.
4. *The remediation goal for GRO changed from 1,300 ug/L to 2,200 ug/L in 2008.
5. The change in the size of the DRO plume above 10,000 ug/L is due to the removal of F8-4 and F8-5 from the sampling program.
6. Coordinate System - Projection: World Geodetic System 1984 (WGS84) Universal Transverse Mercator (UTM), Zone 6N
7. Aerial imagery obtained from Department of Public Works (DPW) Environmental, 2012

BENZENE
- APPROXIMATE EXTENT OF BENZENE PLUME ABOVE REMEDIATION GOAL OF 5 ug/L
- APPROXIMATE EXTENT OF BENZENE PLUME ABOVE REMEDIATION GOAL OF 100 ug/L
- APPROXIMATE EXTENT OF FREE PHASE PRODUCT

DRO
- APPROXIMATE EXTENT OF BENZENE PLUME ABOVE REMEDIATION GOAL OF 5 ug/L
- APPROXIMATE EXTENT OF DRO PLUME WITH CONCENTRATIONS ABOVE 10,000 ug/L
- APPROXIMATE EXTENT OF FREE PHASE PRODUCT

GRO
- APPROXIMATE EXTENT OF GRO PLUME ABOVE REMEDIATION GOAL * (SEE NOTES)
- APPROXIMATE EXTENT OF GRO PLUME WITH CONCENTRATIONS ABOVE 10,000 ug/L
- APPROXIMATE EXTENT OF FREE PHASE PRODUCT

SOURCE:

1994 plume data, Harding Lawson Associates, North Airfield Groundwater Investigation, January 1995

LEGEND:

ug/L Micrograms per Liter
DRO Diesel Range Organics
GRO Gasoline Range Organics

TREATMENT SYSTEM SUMMARY

	INSTALLATION	EXPANSION	SHUTDOWN	DECOMMISSIONED
SOURCE AREA	1998	2001	2005	2011
HORIZONTAL WELL	1997	2001	2005	2011
SPARGE CURTAIN	1998	2001	2012	TO BE DETERMINED

N

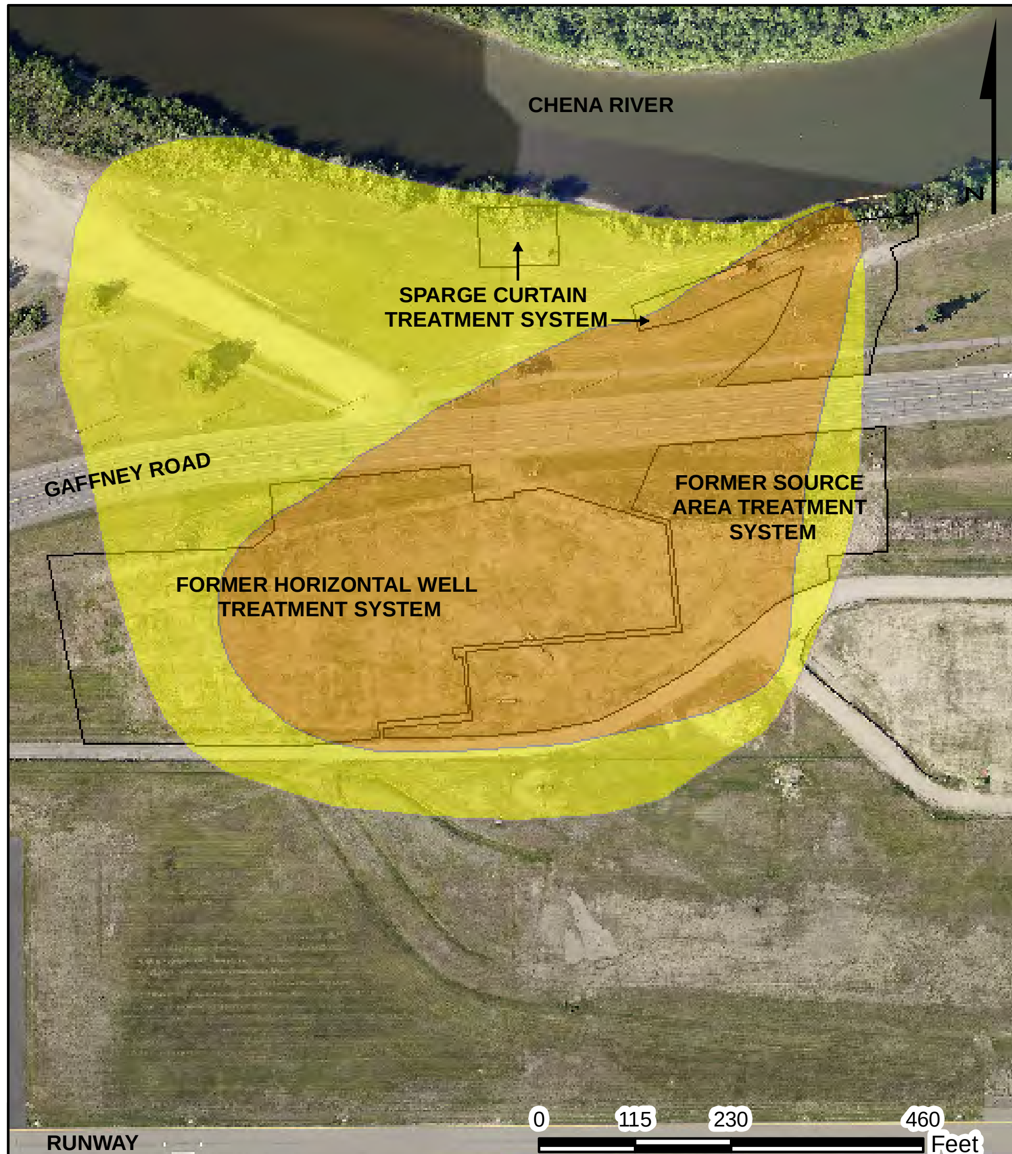
0 145 290 580 Feet

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DRO, GRO, and Benzene Contaminant Plume Changes in the WQFS
2015 Monitoring Report
Operable Unit 5
Fort Wainwright, Alaska

Contract: W911KB-12-D-0001 | Figure: 4-2 | Date: 8/16

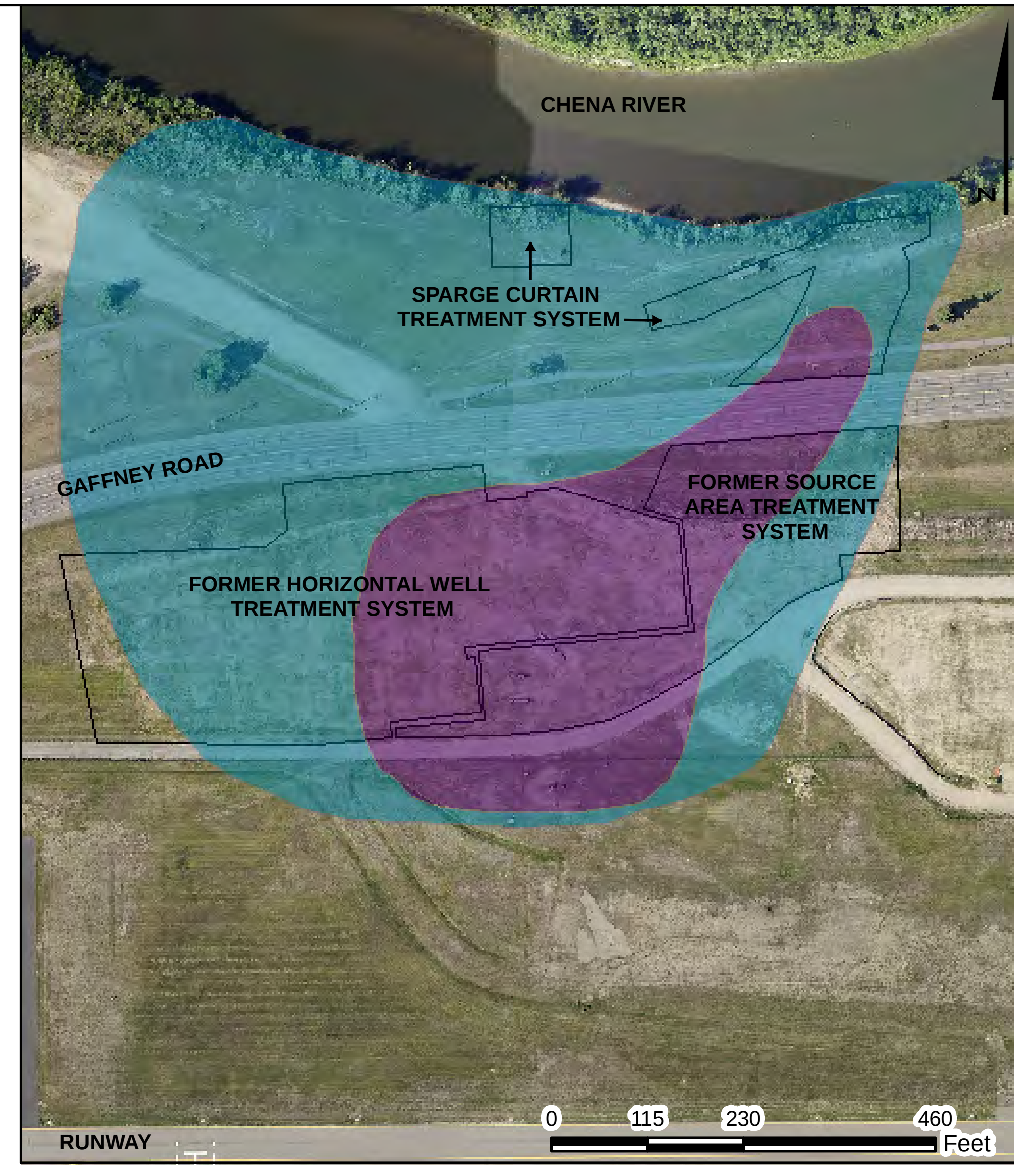


2015

DISSOLVED IRON

APPROXIMATE EXTENT OF DISSOLVED IRON CONCENTRATIONS GREATER THAN 1 MG/L

APPROXIMATE EXTENT OF DISSOLVED IRON CONCENTRATIONS GREATER THAN 10 MG/L



2015

DISSOLVED MANGANESE

APPROXIMATE EXTENT OF DISSOLVED MANGANESE CONCENTRATIONS GREATER THAN 1 MG/L

APPROXIMATE EXTENT OF DISSOLVED MANGANESE CONCENTRATIONS GREATER THAN 5 MG/L

2015

SULFATE

APPROXIMATE EXTENT OF DISSOLVED SULFATE CONCENTRATIONS GREATER THAN 5 MG/L

NOTES:

1. Drawings are conceptual and are based on evaluation of available information.
2. Coordinate System - Projection: World Geodetic System 1984 (WGS84) Universal Transverse Mercator (UTM), Zone 6N
3. Aerial imagery obtained from Department of Public Works (DPW) Environmental, 2012

LEGEND:

MG/L MILLIGRAMS

Fairbanks Environmental Services
3538 International Street
Fairbanks, AK 99701

Alaska District
U.S. Army Corps of Engineers
Anchorage, AK

Estimated Extents of Iron, Manganese and Sulfate Reduction in the WQFS
2015 Monitoring Report
Operable Unit 5
Fort Wainwright, Alaska

Contract: W911KB-12-D-0001 | Figure: 4-3 | Date: 8/16

Tables and Charts from Final 2015 Monitoring Report (extracted from the document text)

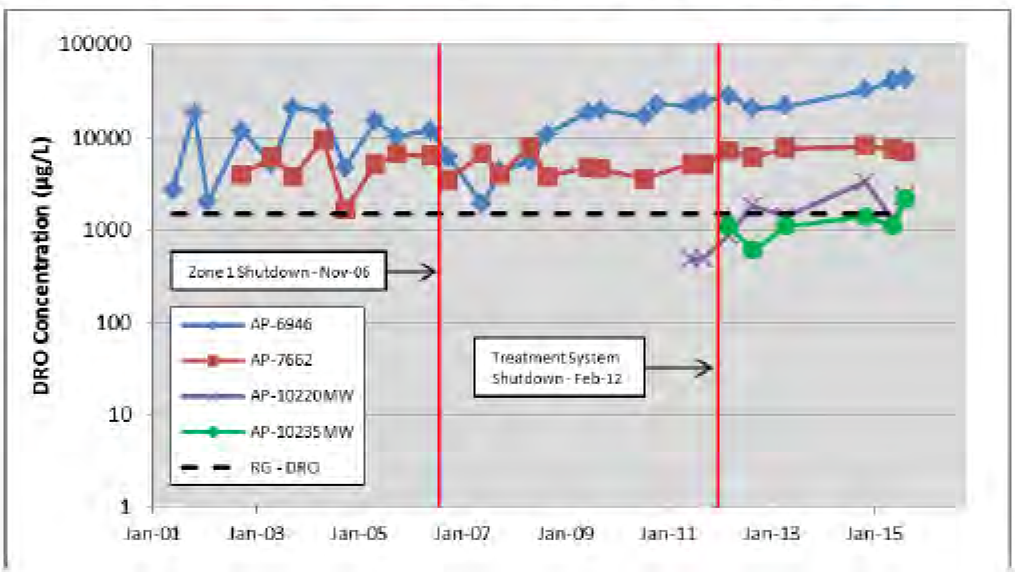
Table 3-1. Summary of 2015 Sparge Curtain Groundwater Monitoring

Wells	Screened Interval (feet bgs)	Location	Analytical Parameters
AP-6946	10 – 25	WQFS Source Area	GRO, VOCs, DRO, and Natural Attenuation Parameters[1]
AP-7662	18 – 23		
AP-7727	38 – 43		
AP-7728	30 – 35		
AP-7729	21 – 26		GRO, VOCs, EDB, DRO, PAH, and Natural Attenuation Parameters[1]
AP-10220MW	13 – 23		
AP-10221MW	13 – 23		
AP-10222MW	13 – 23		
AP-10235MW	18 – 23		

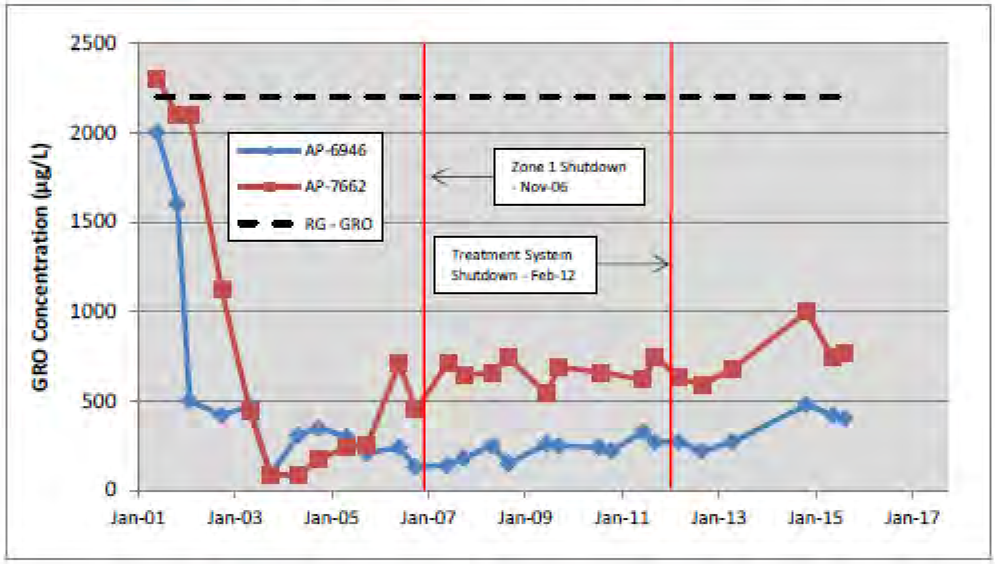
[1] Natural attenuation parameters include dissolved iron, dissolved manganese, and sulfate

bgs – below ground surface; GRO – gasoline range organics; EDB – 1,2-dibromoethane; PAH – polynuclear aromatic hydrocarbons

Graph 3-1. DRO Concentrations in Sparge Curtain Wells



Graph 3-2. GRO Concentrations in Sparge Curtain Wells



Graph 3-3. Benzene Concentrations in Sparge Curtain Wells

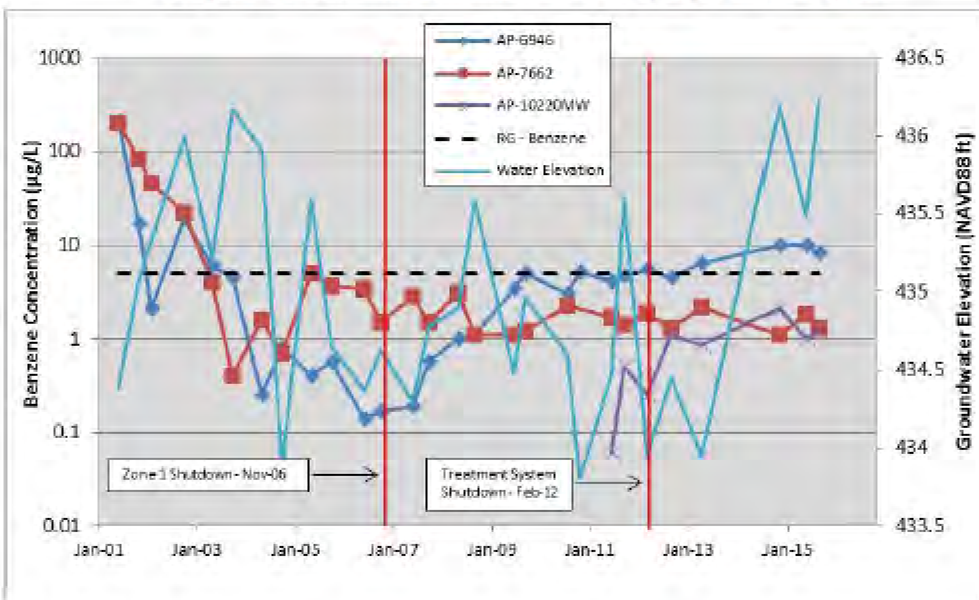


Table 3-3. TAH and TAqH Concentrations in Wells along the Chena River[1]

Well	Location	May 2015		August 2015	
		TAH (µg/L)	TAqH (µg/L)	TAH (µg/L)	TAqH (µg/L)
Alaska Water Quality Standards		**10**	**15**	**10**	**15**
AP-7729	Sparge Curtain	0.5	0.6	0.5	0.6
AP-10220MW		1.4	1.6	1.6	1.8
AP-10221MW		0.5	0.6	0.5	0.6
AP-10222MW		0.5	0.6	0.5	0.6
AP-10235MW		0.5	0.7	0.5	0.7

[1] The LOD was used for calculating TAH and TAqH concentrations for non-detected analytes (ADEC, 2012b)

Table 3-4. Contaminant Concentration Trends for Sparge Curtain Wells (2012 through 2015)[1]

Well Location	DRO	GRO	Benzene
AP-6946	**I**	I[2]	**I[2]**
AP-7662	**NT**	PI	S
AP-10220MW	**NT**	NT[2]	PI[2]
AP-10235MW	**PI[2]**	NA	NA

Wells with trends in **bold type** exceeded cleanup levels during 2015.

[1] All trends are based on Mann-Kendall analysis unless noted. The Mann-Kendall analysis typically resulted in better confidence of the trend than Linear Regression.

[2] Linear Regression trend.

NA – Not Applicable; NT – No Trend; S – Stable; I – Increasing; PI – Potentially Increasing

Table 3-6. Chena River Sheen Observations (2012 through 2015)

Station ID	Number of Sheen Observations				
	2012[1]	2013[2]	2014[3]	2015	TOTAL
0+00	0	0	0	0	0
0+10	0	0	0	0	0
0+20[5]	1[5]	0	0	0	1[5]
0+30[5]	1[5]	0	0	0	1[5]
0+40	0	0	0	0	0
0+50	**6**	0	0	**0**	**6**
0+60	**7**	0	0	**0**	**7**
0+70	**2**	0	0	**0**	**2**
0+80	**2**	**1**	0	**1**	**4**
0+90	**3**	**2**	**1**	**1**	**7**
1+00	**4**	**4**	**1**	**1**	**10**
1+10	**3**	**8**	**1**	**1**	**13**
1+20	**2**	**3**	0	**1**	**6**
1+30	0	0	0	**1**	**1**
1+40	0	0	0	0	0
1+50	0	0	0	0	0
1+60	0	0	0	0	0
1+70	0	0	0	0	0
1+80	0	0	0	0	0

BOLD indicates sheen detected during weekly inspections

Gray shading indicates the observation stations covered by the boom system

[1] A total of 26 inspections were conducted in 2012

[2] A total of 21 inspections were conducted in 2013

[3] A total of 4 inspections were conducted in 2014

[4] A total of 11 observations were conducted in 2015

[5] Sheen identified at 0+20 and 0+30 were associated with a storm water outfall and not contamination from OU5

Table 4-1. Summary of 2015 WQFS Groundwater Monitoring

Wells	Screened Interval (feet bgs)	Location	Analytical Parameters
AP-7455S	19 – 24	DRO Plume and Benzene Area	DRO, GRO, VOCs, and NA Parameters[1]
AP-10260MW[2]	14 – 19		
OU5-TW6	14 – 24		
OU5-TW2	14 – 19		DRO, VOCs, and NA Parameters[1]
OU5-TW3	14 – 19		
OU5-TW5	14 – 19		
OU5-TW7	14 – 24		
OU5-TW8	13.5 – 23.5		
OU5-TW9	12.5 – 22.5		
OU5-TW10	14 – 24		
OU5-TW4[3]	14-19		BROKEN - NO SAMPLE COLLECTED
AP-5974	13 – 23	DRO Plume	DRO, GRO, VOCs, and NA Parameters[1]
AP-8064	12 – 22		
AP-5975	13 – 23		DRO, VOCs, and NA Parameters[1]
AP-6887	9.5 – 27.5		
AP-6888	12 – 27.5		
AP-6889	11.5 – 21.5		
AP-7742	16 – 21		
AP-8065	13 – 23		
AP-8066	12.5 – 22.5		
AP-10043MW	13.5 – 23.5		
AP-6882	10 – 27	Chena River Wells	DRO, VOCs, and NA Parameters[1]
AP-6892	7.5 – 22.5		
AP-6893	11 – 28		
AP-7832S	32 – 37		
AP-7838	14 – 24		

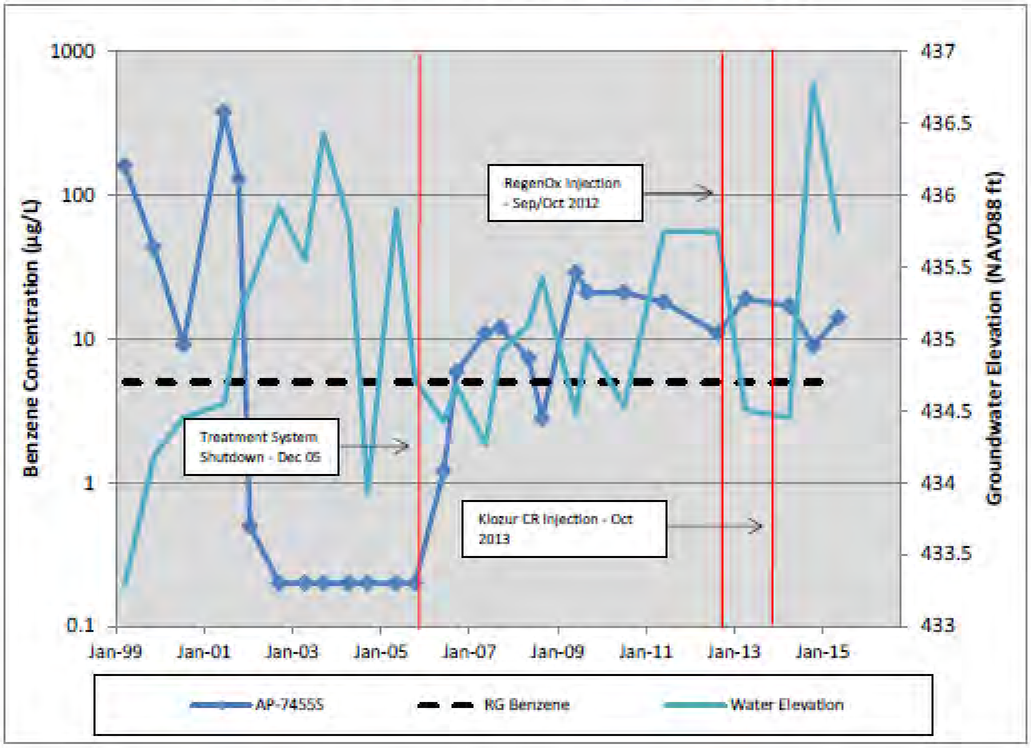
[1] NA (nnatural attenuation) parameters include dissolved iron, dissolved manganese, and sulfate

[2] AP-10260MW is a replacement well for OU5-TW1

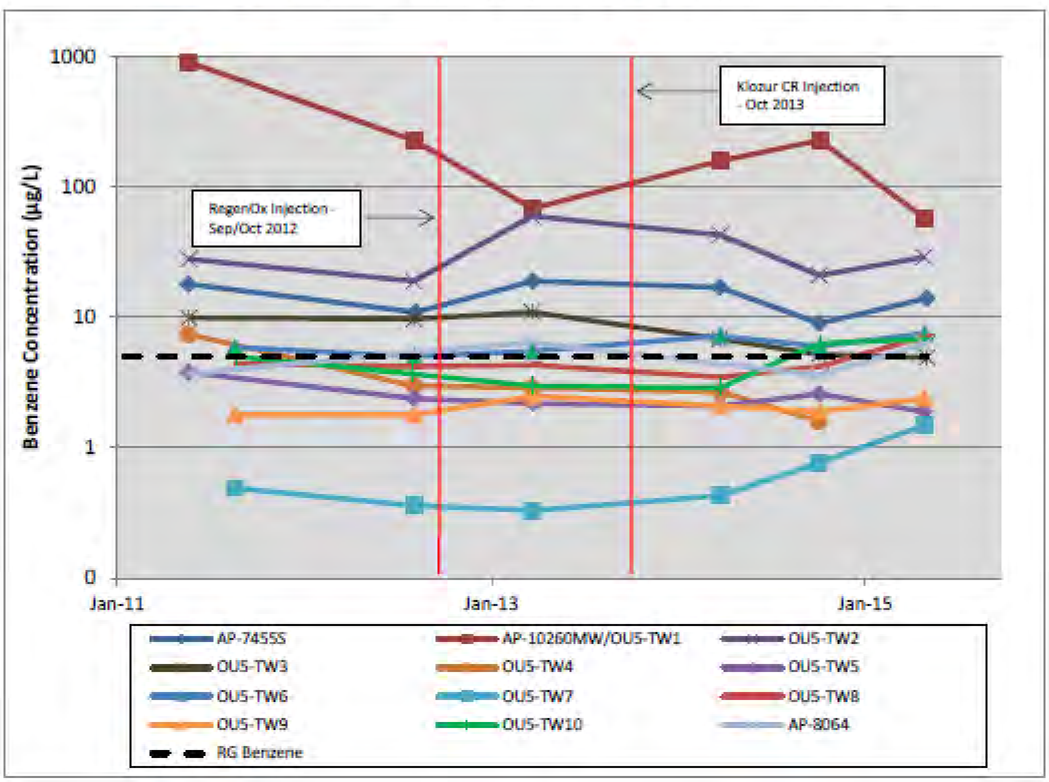
[3] OU5-TW4 could not be sampled due to a broken screen

bgs – below ground surface

Graph 4-1. Benzene Concentration in AP-7455S



Graph 4-2. Benzene Concentrations in WQFS Benzene Area Wells



Graph 4-3. DRO Concentrations in WQFS DRO Plume Wells

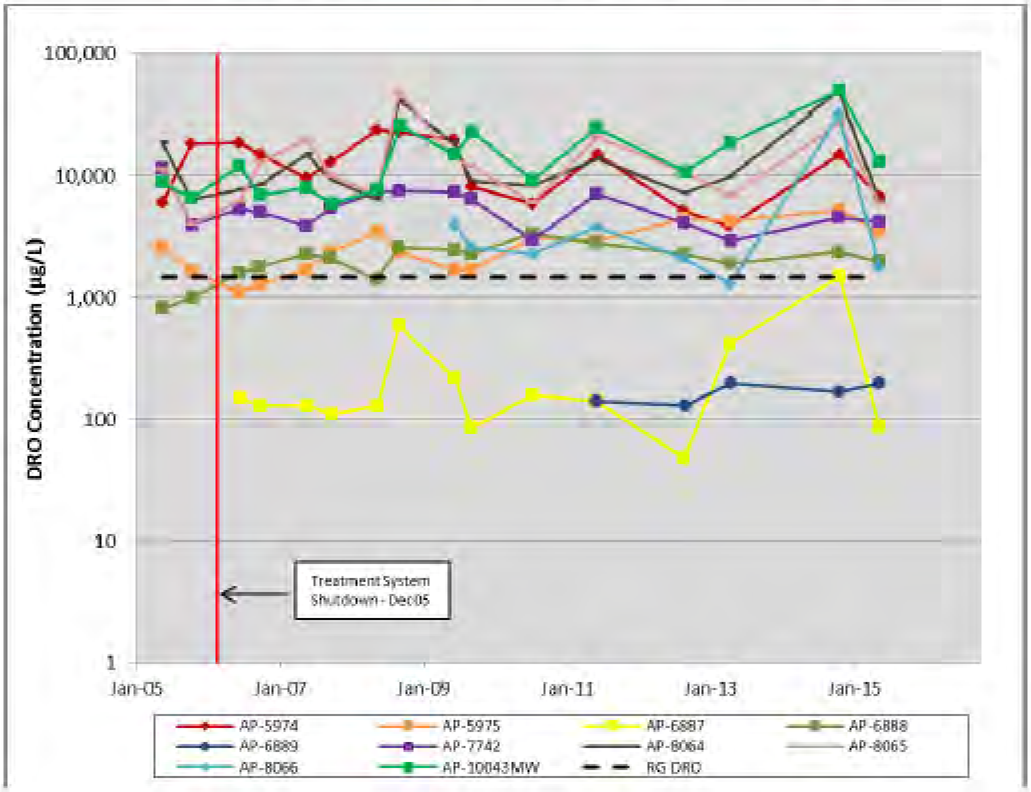


Table 4-5. TAH Concentrations in Wells Nearest the Chena River[1]

Well	October 2015 TAH[1] (µg/L)
AWQS	**10**
AP-6882	0.7
AP-6892	0.5
AP-6893	0.4
AP-7832S	0.5
AP-7838	0.9

[1] The LOD was used for calculating TAH concentrations for non-detected analytes

Table 4-6. Contaminant Trend Analysis Results for WQFS Benzene Area Wells

Well	ISCO Treatability Study (2011 through 2015)		
	DRO	GRO	Benzene
AP-7455S	**PI (NT)**	I (NT)	**S (S)**
AP-8064	**NT (NT)**	S (PD[1])	**NT** (S)
OU5-TW1/AP-10260MW	**S (S)**	**D (PD[1])**	**PD (NT[1])**
OU5-TW2	**NT (NT[1])**	N/A (N/A)	**NT (NT[1])**
OU5-TW3	**S (D)**	N/A (N/A)	D **(PD[1])**
OU5-TW4	N/A **(D[1])**	N/A (N/A)	N/A (D)
OU5-TW5	**S (S)**	N/A (N/A)	D[1] (PD[1])
OU5-TW6	**S (S)**	**NT[1] (S)**	**PI[1] (NT)**
OU5-TW7	**NT (NT)**	N/A (N/A)	PI[1] (NT)
OU5-TW8	**S (S)**	N/A (N/A)	**NT[1]** (S)
OU5-TW9	**NT (S)**	N/A (N/A)	NT (NT)
OU5-TW10	**NT (NT)**	N/A (N/A)	**NT (I[1])**

[1] Indicates the linear regression trend was selected over the Mann-Kendall trend

BOLD indicates the analyte was above cleanup levels in the 2014 and/or 2015 sampling event

2014 result shown in parentheses

N/A – Not Applicable due to too few sampling results

NT – No Trend; S – Stable; PD – Potentially Decreasing; D – Decreasing; I – Increasing; PI – Potentially Increasing

Table 4-7. Trend Analysis Results WQFS DRO Plume Wells

Well	Pre & Active Treatment (through 2005)	Post Treatment (Fall 2007 through 2015)
	DRO	DRO
AP-5974*	**S**	**PD**
AP-5975	**D**	**I**
AP-6888	D	**S**
AP-7742*	**I**	**PD**
AP-8064	**S**	**S**
AP-8065	**S**	**S**
AP-8066	D	**NT**
AP-10043MW	**S**	**NT**

* AP-5974 is located upgradient of the Horizontal Well treatment system's influence. AP-7742 is on the downgradient edge of the Source Area system's influence.

Wells in **bold type** exceeded the cleanup level during the final year of the analysis (2005 and 2015).

AP-6887 and AP-6889 were not included as these wells only rarely exceeded the cleanup level and were outside of the treatment system influence.

NT – No Trend; S – Stable; PD – Potentially Decreasing; D – Decreasing; PI – Potentially Increasing; I – Increasing

Table 4-8. Plume Stability Analysis for WQFS Benzene Area Wells

Plume Stability Parameter	Mann-Kendall Trend Result		
	DRO	GRO	Benzene
Zeroth Moment (Dissolved Mass)	S	S	NT
First Moment (Distance from the Source to the Center of Mass)	S	D	D
Second Moment (Plume Spread)			
Parallel to Groundwater Flow	D	D	D
Perpendicular to Groundwater Flow	D	S	S

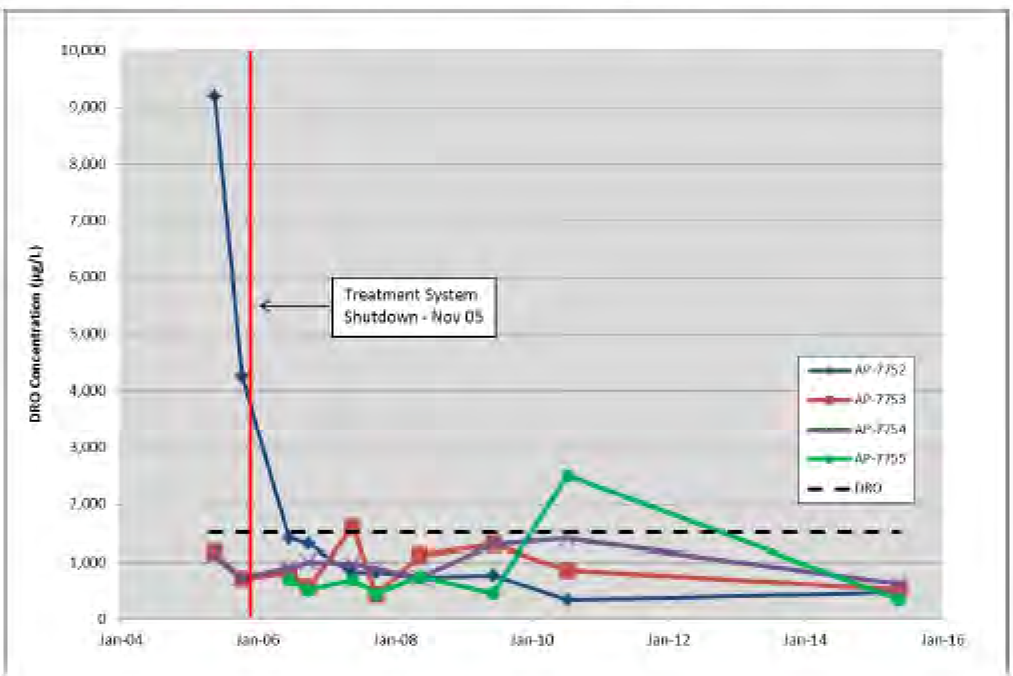
NT – No Trend; S – Stable; D – Decreasing;

Table 5-2. Summary of 2015 EQFS Flowpath D Groundwater Monitoring

Well	Distance Along Flowpath	Screened Interval (feet bgs)	Analytical Parameters
AP-7823	0	12 - 22	DRO and Natural Attenuation Parameters[1]
AP-7751	187	11.5 – 21.5	*Decommissioned in 2013 – not sampled in 2015*
AP-7752	295	11.5 – 21.5	DRO and Natural Attenuation Parameters[1]
AP-7753	357	11.5 – 21.5	
AP-7754	427	11.5 – 21.5	
AP-7755	465	11.5 – 21.5	
AP-7490	547	10 - 20	

[1]Natural attenuation parameters include dissolved iron, manganese, and sulfate.

Graph 5-1. DRO Concentrations in EQFS Flowpath D Wells



OU-5 East Quartermaster's Fueling System

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OU-5 EQFS Trend Analysis

DRO groundwater concentrations (µg/L) were subjected to the Mann-Kendall test to determine if any surveillance well shows a statistically significant upward or downward trend in concentration.

The Mann-Kendall test, described in the USEPA document: Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities Unified Guidance (USEPA, March 2009) and USACE Engineer Manual: Environmental Quality – Environmental Statistics (USACE, May 2013), is an accepted method for identifying the presence of a significant upward trend at surveillance wells. Under this method it is assumed that no discernible linear trend exists in concentration data over time (null hypothesis). To test this hypothesis the Mann-Kendall statistic (test statistic) is determined. The test statistic is a function of the sample data which quantifies the probability associated with the relative magnitudes of the sample data for a given sample size (n). The significance of this probability is determined by comparison to the critical value, a threshold value of statistical significance. Under the normal approximation to the Mann-Kendall test, the critical value is determined based on a 95% level of confidence associated with the standard normal distribution. If the test statistic exceeds the critical value, the null hypothesis is rejected and the alternative hypothesis (concentrations are trending) accepted. For small sample sizes ($n \leq 10$) a slightly different procedure is utilized, in which the probability is calculated directly and compared to the selected level of significance (0.05 for a 95% level of confidence); in this case, the null hypothesis is rejected if the probability is less than the level of significance. Rejection of the null hypothesis is considered to be strong evidence of an upward trend; if the null hypothesis is not rejected there is insufficient evidence for identifying a significant, non-zero trend.

The results of the DRO groundwater concentration trend evaluation are presented in the following table. A downward trend was identified in wells AP 7751, 7752, 7753, 7754 and 7490. No trend was identified in wells AP 7755 and AP 7823.

WELL	SAMPLE SIZE (N)	TEST STATISTIC	CRITICAL VALUE
AP 7751	**21**	**-2.36**	**-1.64**
AP 7752	**22**	**-3.72**	**-1.64**
AP 7753	**22**	**-3.19**	**-1.64**
AP 7754	**22**	**-2.20**	**-1.64**
AP 7755	**15**	**-1.29**	**-1.64**
AP 7490	**15**	**-1.78**	**-1.64**

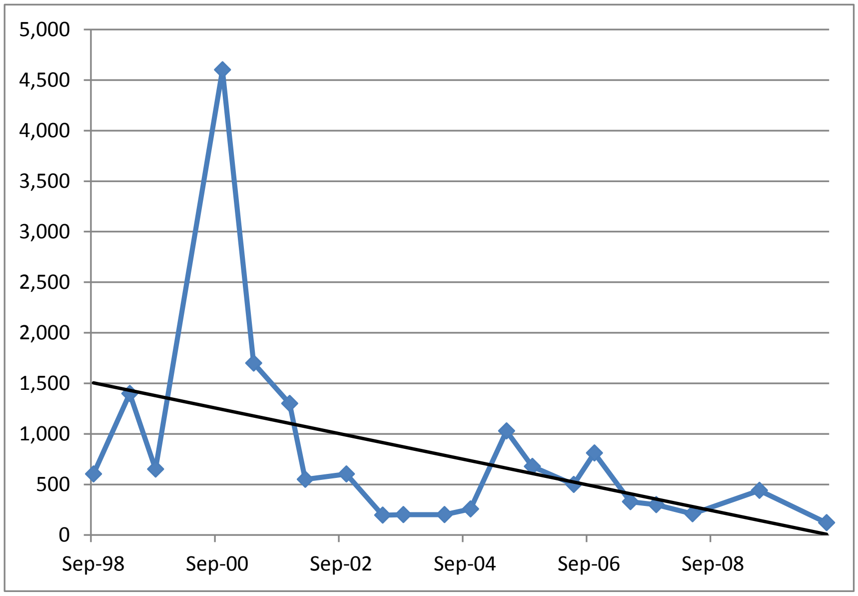
NOTE: If Test Statistic < Critical Value, there is evidence of trending.

WELL	SAMPLE SIZE (N)	TEST PROBABILITY	LEVEL OF SIGNIFICANCE
AP 7823	**8**	**0.4**	**0.05**

NOTE: If the Test Probability < Level of Significance, there is evidence of trending.

Well AP-7751

DRO	**µg/L**
Sep-98	602
Apr-99	1,400
Sep-99	650
Oct-00	4,600
Apr-01	1,700
Nov-01	1,300
Feb-02	550
Oct-02	602
May-03	197
Sep-03	200
May-04	201
Oct-04	256
May-05	1,030
Oct-05	678
Jun-06	500
Oct-06	810
May-07	330
Oct-07	300
May-08	210
Jun-09	440
Jul-10	120



Mann-Kendall Test Using Normal Approximation for Larger Samples

S	-79		
V(S)	1096	n	21
z	**-2.36**		
Z(0.9)	**-1.28**	Z(0.95)	**-1.64**

Ho: No trend

Ha: Downward Trend

Reject Ho if z< Z(0.9)

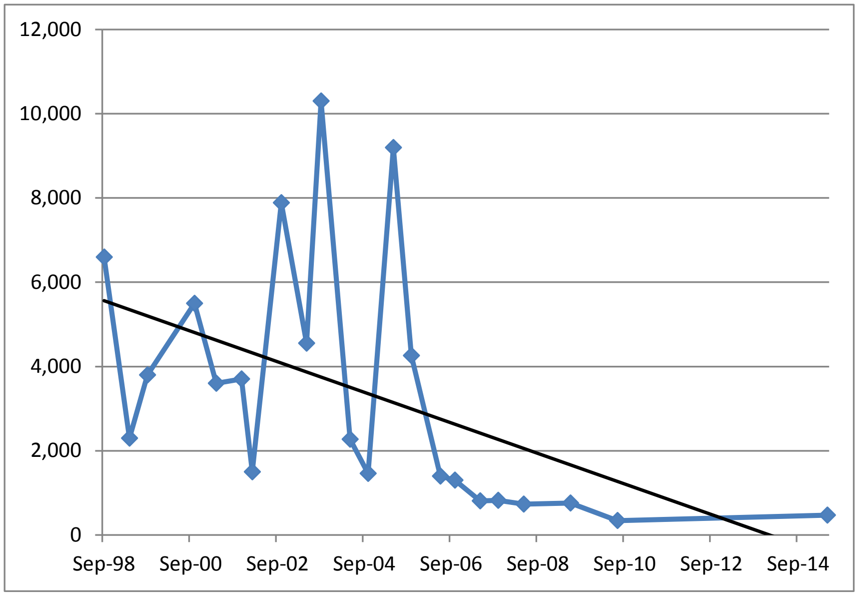
Ho is rejected, there is evidence of a downward trend at the 90% level of confidence

Reject Ho if z< Z(0.95)

Ho is rejected, there is evidence of a downward trend at the 95% level of confidence

DRO	µg/L
Sep-98	6,600
Apr-99	2,300
Sep-99	3,800
Oct-00	5,500
Apr-01	3,600
Nov-01	3,700
Feb-02	1,500
Oct-02	7,890
May-03	4,550
Sep-03	10,300
May-04	2,270
Oct-04	1,460
May-05	9,200
Oct-05	4,260
Jun-06	1,400
Oct-06	1,300
May-07	810
Oct-07	820
May-08	730
Jun-09	760
Jul-10	340
May-15	470

Well AP-7752



Mann-Kendall Test Using Normal Approximation for Larger Samples

S	-133		
V(S)	1258	n	22
z	**-3.72**		
Z(0.9)	**-1.28**	Z(0.95)	**-1.64**

Ho: No trend

Ha: Downward Trend

Reject Ho if z< Z(0.9)

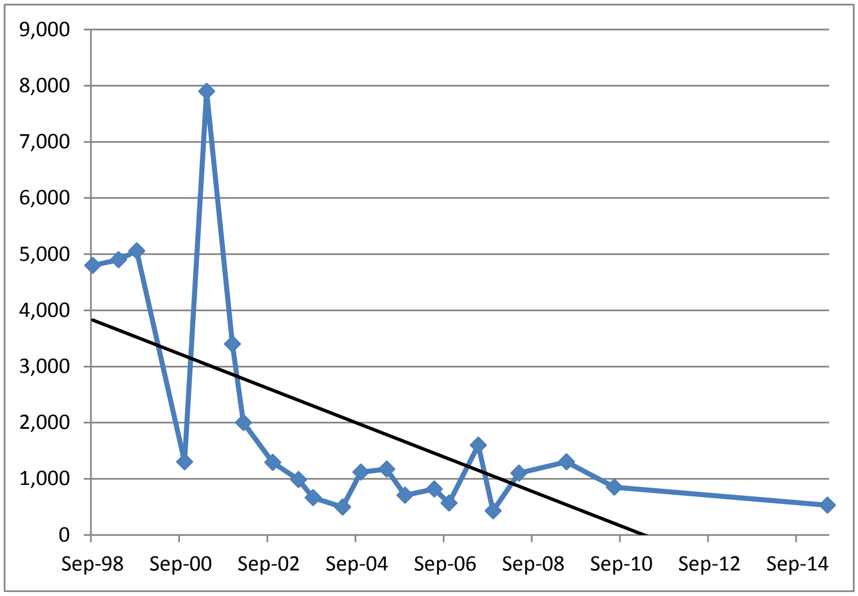
Ho is rejected, there is evidence of a downward trend at the 90% level of confidence

Reject Ho if z< Z(0.95)

Ho is rejected, there is evidence of a downward trend at the 95% level of confidence

Well AP-7753

DRO	µg/L
Sep-98	4,800
Apr-99	4,900
Sep-99	5,060
Oct-00	1,300
Apr-01	7,900
Nov-01	3,400
Feb-02	2,000
Oct-02	1,290
May-03	985
Sep-03	662
May-04	496
Oct-04	1,120
May-05	1,170
Oct-05	707
Jun-06	820
Oct-06	570
Jun-07	1,600
Oct-07	430
May-08	1,100
Jun-09	1,300
Jul-10	850
May-15	530



Mann-Kendall Test Using Normal Approximation for Larger Samples

S	-114		
V(S)	1257	n	22
z	**-3.19**		
Z(0.9)	**-1.28**	Z(0.95)	**-1.64**

Ho: No trend

Ha: Downward Trend

Reject Ho if z< Z(0.9)

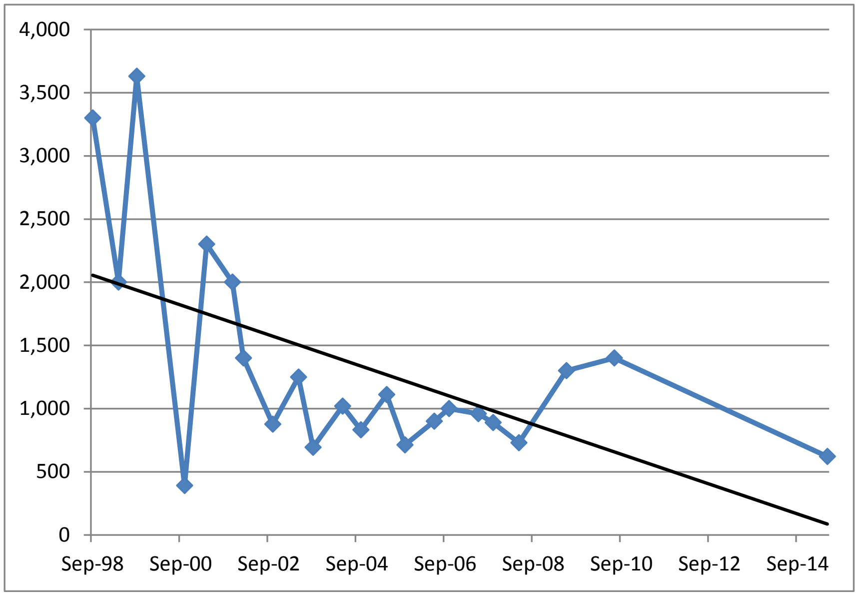
Ho is rejected, there is evidence of a downward trend at the 90% level of confidence

Reject Ho if z< Z(0.95)

Ho is rejected, there is evidence of a downward trend at the 95% level of confidence

DRO	µg/L
Sep-98	3,300
Apr-99	2,000
Sep-99	3,630
Oct-00	390
Apr-01	2,300
Nov-01	2,000
Feb-02	1,400
Oct-02	876
May-03	1,250
Sep-03	693
May-04	1,020
Oct-04	832
May-05	1,110
Oct-05	712
Jun-06	900
Oct-06	1,000
Jun-07	960
Oct-07	890
May-08	730
Jun-09	1,300
Jul-10	1,400
May-15	620

Well AP-7754



Mann-Kendall Test Using Normal Approximation for Larger Samples

S	-79		
V(S)	1256	n	22
z	**-2.20**		
Z(0.9)	**-1.28**	Z(0.95)	**-1.64**

Ho: No trend

Ha: Downward Trend

Reject Ho if z< Z(0.9)

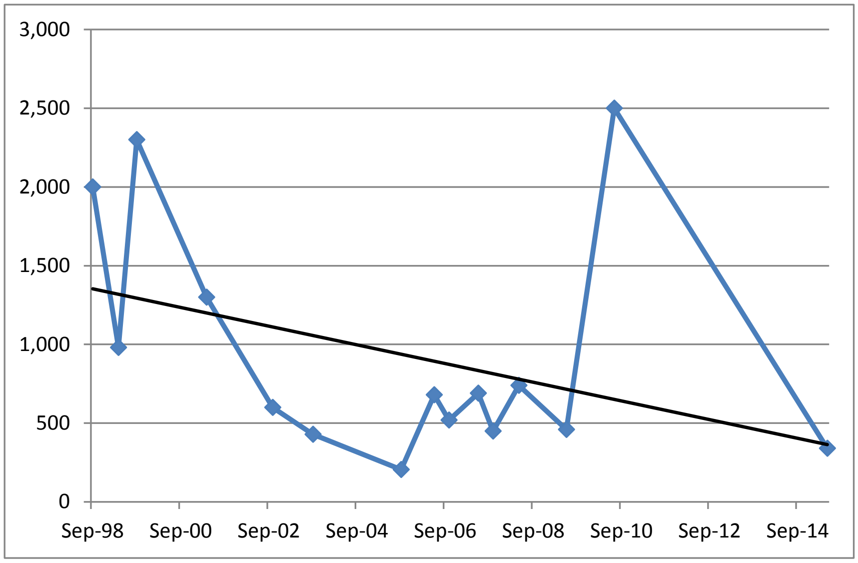
Ho is rejected, there is evidence of a downward trend at the 90% level of confidence

Reject Ho if z< Z(0.95)

Ho is rejected, there is evidence of a downward trend at the 95% level of confidence

DRO	µg/L
Sep-98	2,000
Apr-99	980
Sep-99	2,300
Apr-01	1,300
Oct-02	600
Sep-03	429
Sep-05	205
Jun-06	680
Oct-06	520
Jun-07	690
Oct-07	450
May-08	740
Jun-09	460
Jul-10	2,500
May-15	340

Well AP-7755



Mann-Kendall Test Using Normal Approximation for Larger Samples

S	-27		
V(S)	408.33	n	15
z	**-1.29**		
Z(0.9)	**-1.28**	Z(0.95)	**-1.64**

Ho: No trend

Ha: Downward Trend

Reject Ho if z< Z(0.9)

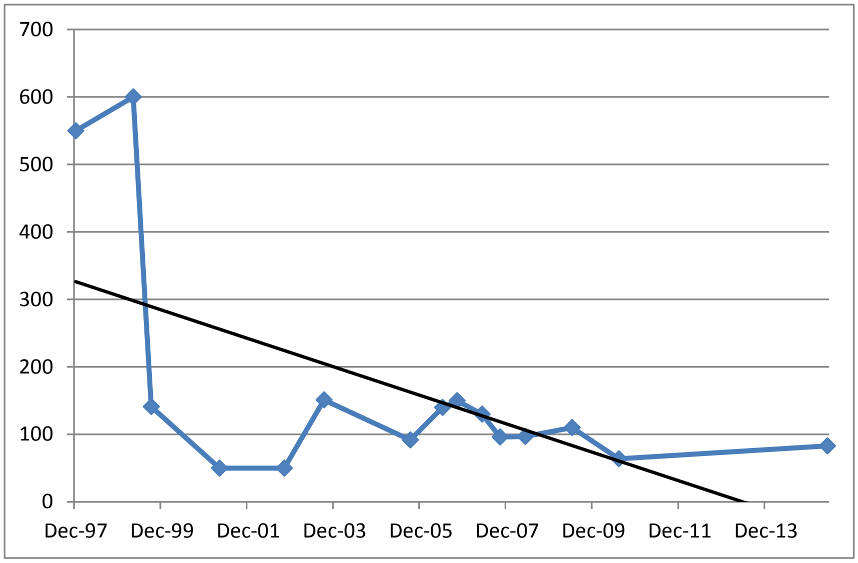
Ho is rejected, there is evidence of a downward trend at the 90% level of confidence

Reject Ho if z< Z(0.95)

Ho is not rejected, there is no evidence of a downward trend at the 95% level of confidence

DRO	µg/L
Dec-97	550
Apr-99	600
Sep-99	141
Apr-01	50
Oct-02	50
Sep-03	151
Sep-05	91.6
Jun-06	140
Oct-06	150
May-07	130
Oct-07	96
May-08	97
Jun-09	110
Jul-10	64
May-15	83

Well AP-7490



Mann-Kendall Test Using Normal Approximation for Larger Samples

S	-37		
V(S)	407.33	n	15
z	**-1.78**		
Z(0.9)	**-1.28**	Z(0.95)	**-1.64**

Ho: No trend

Ha: Downward Trend

Reject Ho if z< Z(0.9)

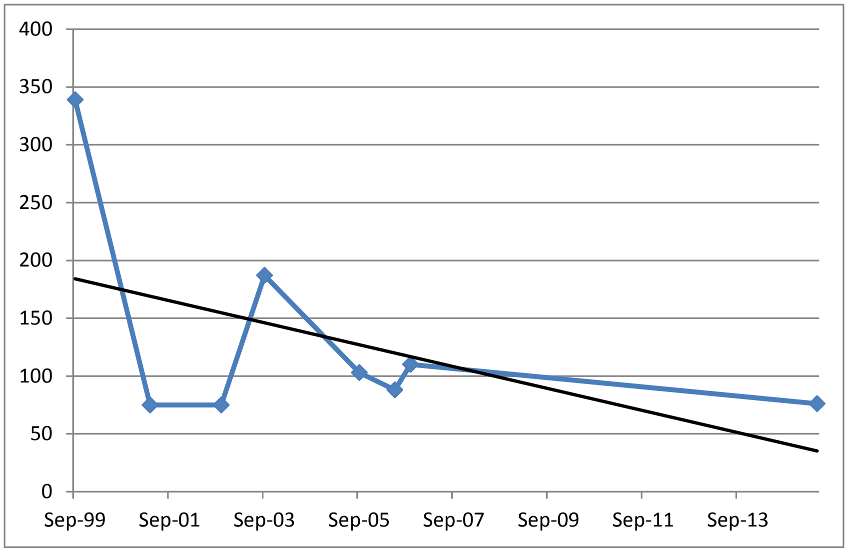
Ho is rejected, there is evidence of a downward trend at the 90% level of confidence

Reject Ho if z< Z(0.95)

Ho is rejected, there is evidence of a downward trend at the 95% level of confidence

Well AP-7823

DRO	**µg/L**
Sep-99	339
Apr-01	75
Oct-02	75
Sep-03	187
Sep-05	103
Jun-06	88
Oct-06	110
May-15	76



Mann-Kendall Trend Test for Small Sample Sizes (n≤10)

S	-3	
p	**0.400**	From Table B-10
n	8	

Ho: No trend

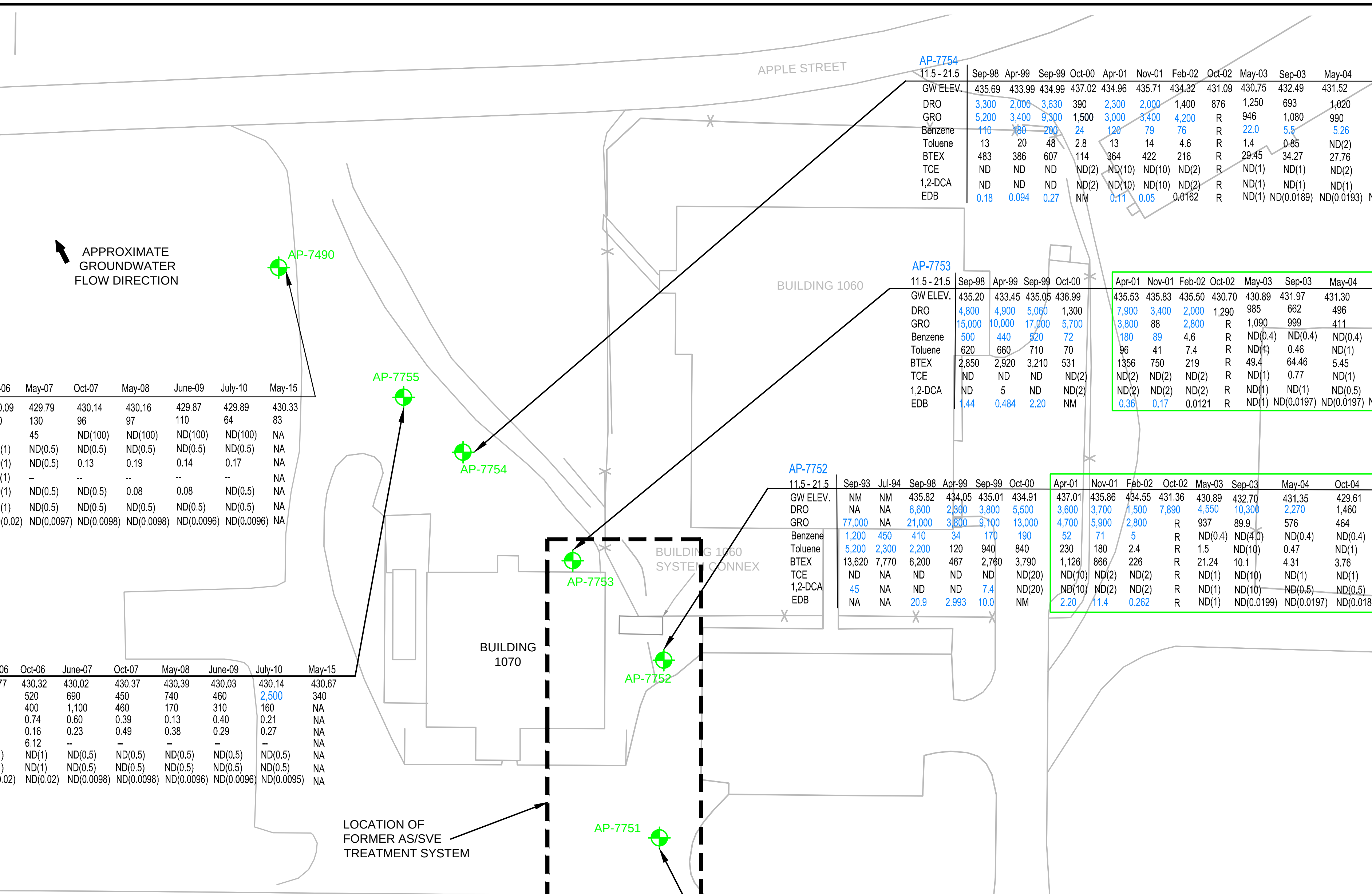
Ha: Downward Trend

Reject Ho if p< 0.1

Ho is not rejected, there is no evidence of a downward trend at the 90% level of confidence

Reject Ho if p< 0.05

Ho is not rejected, there is no evidence of a downward trend at the 95% level of confidence



AP-7754 (11.5 - 21.5)

11.5 - 21.5	Sep-98	Apr-99	Sep-99	Oct-00	Apr-01	Nov-01	Feb-02	Oct-02	May-03	Sep-03	May-04
GW ELEV.	435.69	433.99	434.99	437.02	434.96	435.71	434.32	431.09	430.75	432.49	431.52
DRO	3,300	2,000	3,630	390	2,300	2,000	1,400	876	1,250	693	1,020
GRO	5,200	3,400	9,300	1,500	3,000	3,400	4,200	R	946	1,080	990
Benzene	110	180	200	24	120	79	76	R	22.0	5.5	5.26
Toluene	13	20	48	2.8	13	14	4.6	R	1.4	0.85	ND(2)
BTEX	483	386	607	114	364	422	216	R	29.45	34.27	27.76
TCE	ND	ND	ND	ND(2)	ND(10)	ND(10)	ND(2)	R	ND(1)	ND(1)	ND(2)
1,2-DCA	ND	ND	ND	ND(2)	ND(10)	ND(10)	ND(2)	R	ND(1)	ND(1)	ND(1)
EDB	0.18	0.094	0.27	NM	0.11	0.05	0.0162	R	ND(1)	ND(0.0189)	ND(0.0193)

11.5 - 21.5	Oct-04	May-05	Oct-05	June-06	Oct-06	June-07	Oct-07	May-08	June-09	July-10	May-15
GW ELEV.	429.48	431.41	430.52	430.81	430.36	429.95	430.40	430.44	430.08	430.15	430.72
DRO	832	1,110	712	900	1,000	960	890	730	1,300	1,400	620
GRO	2,040	1,520	1,410	1,000	1,800	1,200	1,300	930	2,000	330	NA
Benzene	7.87	3.41	2.15	1.1	2.1	1.6	1.9	1.2	1.4	0.78	NA
Toluene	0.64	ND(1)	0.760	ND(1)	1.6	0.78	1.8	0.76	1.6	0.55	NA
BTEX	43.23	32.48	81.8	42.6	145	--	--	--	--	--	NA
TCE	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	0.30	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	NA
1,2-DCA	ND(0.5)	ND(0.5)	ND(0.5)	ND(1)	ND(1)	0.31	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	NA
EDB	ND(0.0187)	ND(0.0193)	ND(0.0198)	ND(0.02)	ND(0.02)	ND(0.0097)	ND(0.0098)	ND(0.0096)	ND(0.0096)	ND(0.0095)	NA

AP-7753 (11.5 - 21.5)

11.5 - 21.5	Sep-98	Apr-99	Sep-99	Oct-00	Apr-01	Nov-01	Feb-02	Oct-02	May-03	Sep-03	May-04
GW ELEV.	435.20	433.45	435.05	436.99	435.53	435.83	435.50	430.70	430.89	431.97	431.30
DRO	4,800	4,900	5,060	1,300	7,900	3,400	2,000	1,290	985	662	496
GRO	15,000	10,000	17,000	5,700	3,800	88	2,800	R	1,090	999	411
Benzene	500	440	520	72	180	89	4.6	R	ND(0.4)	ND(0.4)	ND(0.4)
Toluene	620	660	710	70	96	41	7.4	R	ND(1)	0.46	ND(1)
BTEX	2,850	2,920	3,210	531	1356	750	219	R	49.4	64.46	5.45
TCE	ND	ND	ND	ND(2)	ND(2)	ND(2)	ND(2)	R	ND(1)	0.77	ND(1)
1,2-DCA	ND	5	ND	ND(2)	ND(2)	ND(2)	ND(2)	R	ND(1)	ND(1)	ND(0.5)
EDB	1.44	0.484	2.20	NM	0.36	0.17	0.0121	R	ND(1)	ND(0.0197)	ND(0.0197)

11.5 - 21.5	Oct-04	May-05	Oct-05	June-06	Oct-06	June-07	Oct-07	May-08	June-09	July-10	May-15
GW ELEV.	428.97	430.89	430.02	430.10	429.80	429.44	429.95	430.02	429.53	429.60	430.05
DRO	1,120	1,170	707	820	570	1,600	430	1,100	1,300	850	530
GRO	595	401	89.1	370	210	580	57	380	720	360	NA
Benzene	ND(0.4)	ND(0.4)	ND(0.4)	0.14	0.23	0.77	0.21	0.54	1.2	0.67	NA
Toluene	ND(1)	ND(1)	ND(1)	0.09	0.15	0.17	1.1	0.55	0.40	0.49	NA
BTEX	4.83	3.73	1.34	2.03	4.53	--	--	--	--	--	NA
TCE	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	NA
1,2-DCA	ND(0.5)	ND(0.5)	ND(0.5)	ND(1)	ND(1)	ND(0.5)	ND(0.5)	ND(0.5)	0.19	0.11	NA
EDB	ND(0.0185)	ND(0.0193)	ND(0.0194)	ND(0.02)	ND(0.02)	ND(0.0096)	ND(0.0097)	ND(0.0095)	ND(0.0095)	ND(0.0095)	NA

AP-7752 (11.5 - 21.5)

11.5 - 21.5	Sep-93	Jul-94	Sep-98	Apr-99	Sep-99	Oct-00	Apr-01	Nov-01	Feb-02	Oct-02	May-03	Sep-03
GW ELEV.	NM	NM	435.82	434.05	435.01	434.91	437.01	435.86	434.55	431.36	430.89	432.70
DRO	NA	NA	6,600	2,300	3,800	5,500	3,600	3,700	1,500	7,890	4,550	10,300
GRO	77,000	NA	21,000	3,800	9,100	13,000	4,700	5,900	2,800	R	937	89.9
Benzene	1,200	450	410	34	170	190	52	71	5	R	ND(0.4)	ND(4.0)
Toluene	5,200	2,300	2,200	120	940	840	230	180	2.4	R	1.5	ND(10)
BTEX	13,620	7,770	6,200	467	2,760	3,790	1,126	866	226	R	21.24	10.1
TCE	ND	NA	ND	ND	ND	ND(20)	ND(10)	ND(2)	ND(2)	R	ND(1)	ND(10)
1,2-DCA	45	NA	ND	ND	7.4	ND(20)	ND(10)	ND(2)	ND(2)	R	ND(1)	ND(10)
EDB	NA	NA	20.9	2.993	10.0	NM	2.20	11.4	0.262	R	ND(1)	ND(0.0199)

11.5 - 21.5	May-04	Oct-04	May-05	Oct-05	June-06	Oct-06	May-07	Oct-07	May-08	June-09	July-10	May-15
GW ELEV.	431.35	429.61	431.58	430.66	430.86	430.50	429.99	430.56	430.74	430.23	430.28	430.83
DRO	2,270	1,460	9,200	4,260	1,400	1,300	810	820	730	760	340	470
GRO	576	464	325	90.3	230	190	290	140	75	200	100	NA
Benzene	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	0.17	0.39	0.16	0.30	0.09	0.12	0.11	NA
Toluene	0.47	ND(1)	0.39	0.44	0.36	0.63	0.61	0.88	0.58	0.41	0.34	NA
BTEX	4.31	3.76	1.44	1.95	2.09	4.18	--	--	--	--	--	NA
TCE	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	NA
1,2-DCA	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(1)	ND(1)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	NA
EDB	ND(0.0197)	ND(0.0185)	ND(0.0196)	ND(0.0190)	0.0079	0.017	0.019	0.025	0.0052	0.0041	0.0056	NA

AP-7490 (10- 20)

10- 20	Dec-97	Apr-99	Sep-99	Apr-01	Oct-02	Sep-03	Sep-05	June-06	Oct-06	May-07	Oct-07	May-08	June-09	July-10	May-15
GW ELEV.	NA	428.71	NA	429.77	430.92	428.71	NA	430.60	430.09	429.79	430.14	430.16	429.87	429.89	430.33
DRO	550	600	141	ND	ND	151	91.6	140	150	130	96	97	110	64	83
GRO	130	250	ND	ND	ND	ND	ND	11	28	45	ND(100)	ND(100)	ND(100)	ND(100)	NA
Benzene	1.7	13	0.73	6.30	ND	ND	ND	ND(1)	ND(1)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	NA
Toluene	ND	ND	ND	ND	ND	ND	ND	ND(1)	ND(1)	ND(0.5)	0.13	0.19	0.14	0.17	NA
BTEX	1.7	13	0.73	6.30	ND	ND	ND	ND(1)	ND(1)	--	--	--	--	--	NA
TCE	ND	ND	ND	ND	ND	ND	ND	ND(1)	ND(1)	ND(0.5)	ND(0.5)	0.08	0.08	ND(0.5)	NA
1,2-DCA	1.2	ND	0.59	ND	ND	ND	ND	ND(1)	ND(1)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	NA
EDB	ND	ND	ND	NA	ND	ND	ND	ND(0.02)	ND(0.02)	ND(0.0097)	ND(0.0098)	ND(0.0098)	ND(0.0096)	ND(0.0096)	NA

AP-7755 (11.5 - 21.5)

11.5 - 21.5	Sep-98	Apr-99	Sep-99	Apr-01	Oct-02	Sep-03	Sep-05	June-06	Oct-06	June-07	Oct-07	May-08	June-09	July-10	May-15
GW ELEV.	430.63	428.85	NA	429.58	431.12	432.42	430.35	430.77	430.32	430.02	430.37	430.39	430.03	430.14	430.67
DRO	2,000	980	2,300	1300	600	429	205	680	520	690	450	740	460	2,500	340
GRO	1,800	ND	2,000	1100	800	437	345	420	400	1,100	460	170	310	160	NA
Benzene	32	46	50	25	0.8	1.05	0.31	0.18	0.74	0.60	0.39	0.13	0.40	0.21	NA
Toluene	2	1	1.3	ND	ND	ND	ND	0.13	0.16	0.23	0.49	0.38	0.29	0.27	NA
BTEX	62	54	65.3	55.5	7	4.03	5.37	4.82	6.12	--	--	--	--	--	NA
TCE	ND	ND	ND	ND	ND	ND	ND	ND(1)	ND(1)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	NA
1,2-DCA	ND	ND	ND	ND	ND	ND	ND	ND(1)	ND(1)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	NA
EDB	0.136	0.047	0.024	0.024	ND	ND	ND	ND(0.02)	ND(0.02)	ND(0.0098)	ND(0.0098)	ND(0.0096)	ND(0.0096)	ND(0.0095)	NA

AP-7751 (11.5 - 21.5)

11.5 - 21.5	Sep-98	Apr-99	Sep-99	Oct-00	Apr-01	Nov-01	Feb-02	Oct-02	May-03	Sep-03	May-04	Oct-04	May-05	Oct-05
GW ELEV.	NM	NM	NM	14.31**	16.15**	15.35**	16.54**	14.80**	15.29**	13.59**	14.55**	16.56**	14.63**	15.53**
DRO	ND	1,400	650	4,600	1,700	1,300	550	ND(602)	197	200	201	256	1,030	678
GRO	7,100	2,600	3,600	4,400	600	530	420	R	53.3	55.4	89	26.9	ND(90)	ND(90)
Benzene	33	13	7.2	12	2.6	0.74	0.72	R	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)
Toluene	880	150	110	140	11	64	6.1	R	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
BTEX	2,695	516	576.2	1,109	117.7	28.54	63	R	ND(0.4)	0.86	7.85	0.8	2.09	ND(1)
TCE	ND	ND	ND	ND(10)	ND(2)	ND(2)	ND(2)	R	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	0.640
1,2-DCA	ND	ND	ND	ND(10)	ND(2)	0.672	ND(2)	R	ND(1)	ND(1)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
EDB	4.89	2.56	3.60	NM	0.80	0.67	0.251	R	ND(1)	ND(0.0188)	ND(0.0197)	ND(0.0186)	ND(0.0198)	ND(0.0192)

11.5 - 21.5	June-06	Oct-06	May-07	Oct-07	May-08	June-09	July-10	Aug-2012	May-15
GW ELEV.	15.37**	15.69**	16.18**	15.59**	15.60**	15.95**	15.95**	15.60**	No sample collected, well has been decommissioned
DRO	500	810	330	300	210	440	120	817	
GRO	85	68B	180	190	20	310	50	192	
Benzene	0.12	0.25	0.14	0.20	ND(0.5)	0.22	0.09	0.15	
Toluene	0.11	0.12	0.13	0.51	0.47	0.37	0.35	ND(1)	
BTEX	3.65	3.63	--	--	--	--	--	--	
TCE	ND(1)	ND(1)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(1)	
1,2-DCA	ND(1)	ND(1)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	
EDB	0.0081J	ND(0.02)	0.0097	0.019	0.0067	0.0042	ND(0.0042)	ND(0.0095)	

** Indicates Depth To Groundwater, AP- 7751 Well Casing Elevation Not Available

AP-7823 (12- 22)

12- 22	Sep-99	Apr-01	Oct-02	Sep-03	Sep-05	June-06	Oct-06	May-15
GW ELEV.	NA	429.48	430.41	438.07	435.99	436.21	435.90	436.34
DRO	339	ND	ND	187	103	88	110	76
GRO	610	130	130	ND	43.4	65	64	NA
Benzene	ND	ND	ND	ND	ND	ND(1)	ND(1)	NA
Toluene	ND	ND	ND	ND	ND	ND(1)	ND(1)	NA
BTEX	ND	ND	ND	ND	ND	ND(1)	ND(3)	NA
TCE	ND	ND	ND	ND	ND	ND(1)	ND(1)	NA
1,2-DCA	ND	ND	ND	ND	ND	ND(1)	ND(1)	NA
EDB	NA	NA	ND	ND	ND	ND(0.02)	ND(0.02)	NA

* SAMPLED FOR GEOCHEMICAL ANALYSIS BETWEEN 2007-2010

KEY:

Well number — Sampling Date

Screened interval (feet bgs)

Groundwater elevation in feet (ft) above sea level NAVD-88

Concentration in ug/L

Concentrations exceeding RAOs shown in blue.

AP-7490 10- 20	Dec-97	Apr-99	June-06	Oct-06
GW ELEV.	NA	428.71	430.60	430.09
DRO	550	600	140	150
GRO	130	250	11	28
Benzene	1.7	13	ND(1)	ND(1)
Toluene	ND	ND	ND(1)	ND(1)
BTEX	1.7	13	ND(1)	ND(1)
TCE	ND	ND	ND(1)	ND(1)
1,2-DCA	1.2	ND	ND(1)	ND(1)
EDB	ND	ND	ND(0.02)	ND(0.02)

LEGEND:

AP-7751	Monitoring Well
DRO	Diesel Range Organics
GRO	Gasoline Range Organics
TCE	Trichloroethylene
1,2-DCA	1,2-Dichloroethane
EDB	1,2-Dibromoethane
ND(0.5)	Not detected (detection limit)
RAO	Remedial Action Objective
R	Data rejected
$\mu g/L$	Micrograms per Liter
--	Not Calculated
(green box)	Treatment System in Operation

NOTES:

1. Cleanup levels for GRO changed from 1,300 $\mu g/L$ to 2,200 $\mu g/L$ in October 2008.
2. The Building 1060 treatment system was shutdown in November 2005 and decommissioned in August 2009.
3. AP-7751 was sampled by Jacobs Engineering in August 2012 prior to well decommissioning.

Contaminant of Concern	RAO $\mu g/L$
DRO	1,500
GRO	2,200
BENZENE	5
TOLUENE	1,000
TCE	5
1,2-DCA	5

0 10 20 40

SCALE IN METERS

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

EQFS Groundwater Contaminant Concentrations

2015 Monitoring Report
Operable Unit 5
Fort Wainwright, Alaska

CONTRACT: W911KB-12-D-0001 | FIGURE: 5-1 | DATE: 1/16

Fig 5-1 EQFS

Table 5-1 - Flowpath D Groundwater Monitoring Results

Probe/Well Number	Distance Along Flowpath (ft)	Location	Sample Numbers	Screened Interval (feet-bgs)	Date	Water Elevation (ft-msl)	Dissolved Oxygen (mg/L)	Redox (mV)	Dissolved Manganese (mg/L)	Field Screened Manganese[1] (mg/L)	Dissolved Iron (mg/L)	Field Screened Iron[1] (mg/L)	Sulfate (mg/L)	Field Screened Sulfate[1] (mg/L)	ROD Chemicals of Concern						
															GRO (µg/L)	DRO (µg/L)	Benzene (µg/L)	Toluene (µg/L)	TCE (µg/L)	1,2-DCA (µg/L)	EDB by 504.1 (µg/L)
ROD CLEANUP LEVELS (µg/L)															2,200	1,500	5	1,000	5	5	0.05
AP-7823	0	Upgradient	07FWFPD01WG	12-22	5/31/07	435.43	0.83	7.6	1.59 Q	1.7	1.86 Q	1.8	24.6 Q	46	NA	NA	NA	NA	NA	NA	NA
			07FWFPD17WG		10/5/07	436.05	0.52	15.4	1.30	0.7	1.5	2.1	17.8	18	NA	NA	NA	NA	NA	NA	NA
			NA[2]		5/23/08	436.23	0.55	-32.1	NA	0.3	NA	1.7	NA	13	NA	NA	NA	NA	NA	NA	NA
			NA[2]		6/21/09	435.70	0.45	136.1	NA	1.8	NA	0.8	NA	21	NA	NA	NA	NA	NA	NA	NA
			10FW5D07WG		7/22/10	435.77	0.36	-42.2	1.10	0.9	2.12	2.1	25.2	22	NA	NA	NA	NA	NA	NA	NA
			15FWOU547WG		5/27/15	436.34	0.24	53.0	1.07	NA	1.83	NA	20.9	NA	NA	76 J,B	NA	NA	NA	NA	NA
AP-7751	187	Upgradient	07FWFPD02WG	11.5-21.5	5/31/07	NA	0.57	1.6	0.919 Q	0.6	1.31 Q	1.6	32.2 Q	52	180 Q	330 J,Q	0.14 J,Q	0.13 J,B,Q	ND (0.5) Q	ND (0.5) Q	ND(0.0097) Q
			07FWFPD10WG		10/5/07	NA	0.33	15.6	1.040	0.9	1.49	1.7	28.7	25	190	300 J	0.20 J	0.51	ND (0.5)	ND (0.5)	0.019
			08FW5D07WG		5/26/08	NA	0.39	65.8	NA	1.5	NA	0.9	NA	18	20 J	210 J	ND (0.5)	0.47 J	ND (0.5)	ND (0.5)	0.0067
			09FW5D04WG		6/21/09	NA	0.45	-37.3	NA	1.2	NA	1	NA	31	310	440 J	0.22 J	0.37 J	ND (0.5)	ND (0.5)	0.0042 J
			10FW5D01WG		7/22/10	NA	0.23	61.7	1.87	1.6	1.36	1.2	29.1	28	50 J	120 J	0.09 J	0.35 J, B	ND (0.5)	ND (0.5)	ND(0.0095)
			12FWA-B1060-GW-MW7751		8/31/12	NA	0.23	28.1	NA	NA	NA	NA	NA	NA	156	671	0.15 J	ND (1)	ND(1)	ND(0.5)	ND(0.0095)
			12FWA-B1060-GW-MW7751X[3]			NA									192	817	0.13 J	ND (1)	ND(1)	ND(0.5)	ND(0.0095)
AP-7752	295	Within Plume	07FWFPD03WG	11.5-21.5	5/31/07	429.99	0.63	-1.2	3.20 Q	3.7	6.48 Q	6.9	19.6 Q	39	290 Q	810 J,Q	0.16 J,Q	0.61 Q	ND (0.5) Q	ND (0.5) Q	0.019 Q
			07FWFPD11WG		10/5/07	430.56	0.41	-13.9	3.89	2.4	5.11	5.0	19.8	11	140	820	0.30 J	0.88	ND (0.5)	ND (0.5)	0.025
			08FW5D01WG		5/24/08	430.74	1.81	56.4	NA	1.2	NA	1.6	NA	22	75 J	730 J	0.09 J	0.58	ND (0.5)	ND (0.5)	0.0052 J
			09FW5D02WG		6/21/09	430.23	0.8	119	NA	1.3	NA	1.0	NA	26	200	760 J	0.12 J	0.41 J	ND (0.5)	ND (0.5)	0.0041 J
			10FW5D03WG		7/22/10	430.28	0.2	-2.9	NA	1.6	NA	2.5	NA	26	100	340 J	0.11 J	0.34 J, B	ND (0.5)	ND (0.5)	0.0056 J
			15FWOU548WG		5/27/15	430.83	0.53	64.0	1.29	NA	2.97	NA	16.4	NA	NA	470 J	NA	NA	NA	NA	NA
AP-7753	357	Within Plume	07FWFPD04WG	11.5-21.5	6/1/07	429.44	0.82	51.4	0.678 Q	2.0	1.59 Q	1.2	42.4 Q	70	580	**1,600 Q**	0.77 Q	0.17 J,B,Q	ND (0.5) Q	ND (0.5) Q	ND(0.0096) Q
			07FWFPD14WG		10/5/07	429.95	4.53	38.9	0.298	0.0	0.0614	0.1	14.3	12	57 J	430 J	0.21 J	1.1	ND (0.5)	ND (0.5)	ND (0.0097)
			08FW5D02WG		5/24/08	430.02	2.00	61.70	NA	1.9	NA	1.7	NA	16	380	1,100	0.54	0.55	ND (0.5)	ND (0.5)	ND (0.0095)
			09FW5D06WG		6/21/09	429.53	0.61	82.30	NA	4.1	NA	4.3	NA	18	720	1,300	1.2	0.40 J	ND (0.5)	0.19 J	ND (0.0095)
			10FW5D04WG		7/22/10	429.60	0.38	22.90	NA	0.7	NA	4.0	NA	30.4	360	850	0.67	0.49 J, B	ND (0.5)	0.11 J	ND (0.0095)
			15FWOU546WG		5/27/15	430.05	0.43	41.30	2.88	NA	8.58	NA	9.7	NA	NA	530 J	NA	NA	NA	NA	NA
AP-7754	427	Within Plume	07FWFPD05WG	11.5-21.5	6/1/07	429.95	1.48	1.2	1.65 Q	1.4	6.26 Q	5.1	17.1 Q	23	1,200 Q	960 Q	1.6 Q	0.78 Q	0.30 J,Q	0.31 J,Q	ND(0.0097) Q
			07FWFPD15WG		10/5/07	430.40	1.46	94	1.36	0.5	3.23	2.4	30.8	33	1,300	890	1.9	1.8	ND (0.5)	ND (0.5)	ND (0.0098)
			08FW5D04WG		5/26/08	430.44	0.79	84.8	NA	1.5	NA	1.2	NA	0	930	730 J	1.2	0.76	ND (0.5)	ND (0.5)	ND (0.0096)
			09FW5D07WG		6/21/09	430.08	1.2	-52.2	1.94	2.2	6.91	6.3	16.3	14	2,000	1,300 J	1.4	1.6	ND (0.5)	ND (0.5)	ND (0.0096)
			10FW5D05WG		7/22/10	430.15	0.89	1	1.94	2.2	6.91	2.8	16.3	18	330	1,400	0.78	0.55 B	ND (0.5)	ND (0.5)	ND (0.0095)
			15FWOU545WG		5/26/15	430.72	3.04	36.3	1.90	NA	6.89	NA	3.0	NA	NA	620 J	NA	NA	NA	NA	NA
AP-7755	465	Within Plume	07FWFPD08WG	11.5-21.5	6/1/07	430.02	1.24	-16.3	1.42 Q	1.2	5.38 Q	3.7	14.5 Q	18	1,100 Q	690 J,Q	0.60 Q	0.23 J,B,Q	ND (0.5) Q	ND (0.5) Q	ND(0.0098) Q
			07FWFPD13WG		10/5/07	430.37	1.05	89.7	0.758	0.1	0.653	0.2	25.8	20	460	450 J	0.39 J	0.49 J	ND (0.5)	ND (0.5)	ND (0.0098)
			08FW5D05WG		5/26/08	430.39	1.77	72	NA	0.6	NA	0.6	NA	24	170	740	0.13 J	0.38 J	ND (0.5)	ND (0.5)	ND (0.0096)
			09FW5D05WG		6/21/09	430.03	0.79	-20	NA	0.2	NA	1.1	NA	17.7	310	460 J	0.40 J	0.29 J	ND (0.5)	ND (0.5)	ND (0.0096)
			10FW5D06WG		7/22/10	430.14	0.51	89.9	NA	0.1	NA	2.1	NA	17.8	160	**2,500**	0.21 J	0.27 J, B	ND (0.5)	ND (0.5)	ND (0.0095)
			15FWOU543WG		5/26/15	430.67	0.74	70.1	1.64	NA	1.85	NA	16.1	NA	NA	340 J,J-	NA	NA	NA	NA	NA
			15FWOU544WG[3]						1.60	NA	1.83	NA	15.6	NA	NA	340 J,J-	NA	NA	NA	NA	NA
AP-7490	547	Downgradient	07FWFPD07WG	10-20	6/1/07	429.79	2.49	74.5	0.244 Q	0	0.0200 JBQ	0	15.8 Q	23	45 J,B,Q	130 J,Q	ND (0.5) Q	ND (0.5) Q	ND (0.5) Q	ND (0.5) Q	ND(0.0097) Q
			07FWFPD16WG		10/5/07	430.14	3.14	92.9	0.0064	0	0.0095	0	19.5	16	ND (100)	96 J,B	ND (0.5)	0.13 J	ND (0.5)	ND (0.5)	ND (0.0098)
			08FW5D06WG		5/26/08	430.16	0.63	19.7	NA	0.2	NA	0	NA	18	ND (100)	97 J	ND (0.5)	0.19 J	0.08 J	ND (0.5)	ND (0.0098)
			09FW5D01WG		6/19/09	429.87	3.58	59.5	NA	0	NA	0	NA	28	ND (13)	110 J	ND (0.5)	0.14 J	0.08 J	ND (0.5)	ND (0.0096)
			10FW5D02WG		7/22/10	429.89	2.78	93.4	NA	0	NA	0	NA	19.8	ND (100)	64 J	ND (0.5)	0.17 J, B	ND (0.5)	ND (0.5)	ND (0.0096)
			15FWOU542WG		5/26/15	430.33	0.93	68.0	0.016	NA	0.014 B	NA	26.7	NA	NA	83 J,B	NA	NA	NA	NA	NA

Notes:

[1] Natural attenuation indicator parameters were field screened with a colorimeter.

[2] No sample ID given since the sample was field screened only

[3] Sample is a Field Duplicate of the sample immediately above

Acronyms:

bgs - below ground surface.

btoc - below top of casing

DCA - 1,2-Dichloroethane

DRO - Diesel range organics.

EDB - 1,2-Dibromoethane

GRO - Gasoline range organics.

µg/L - microgram per liter.

mg/L - milligrams per liter.

msl - mean sea level

NA - Not analyzed or not applicable.

NM - Not measured.

ROD - Record of Decision.

TOC - top of casing

Data Qualifiers

ND - Not detected at the detection limit (LOD in parentheses; LOQ in parentheses for data prior to 2012.)

B - Result is qualified as a potential high estimate due to contamination present in a blank sample

J - Result is estimated due to a QC issue or because it is less than the LOQ. If result is biased low or high, it is specified as "J-" and "J+", respectively (for 2014 data and later).

Q - Result is estimated due to a QC failure (pre-2014 data only). If direction of bias is known, it is further indicated with a "L" (low) or "H" (high).

M - Result is biased due to matrix interference (pre-2014 data only). If direction of bias is known, it is further indicated with a "L" (low) or "H" (high).

ATTACHMENT 11

Open Burning/Open Detonation Area Historical Figures and Tables

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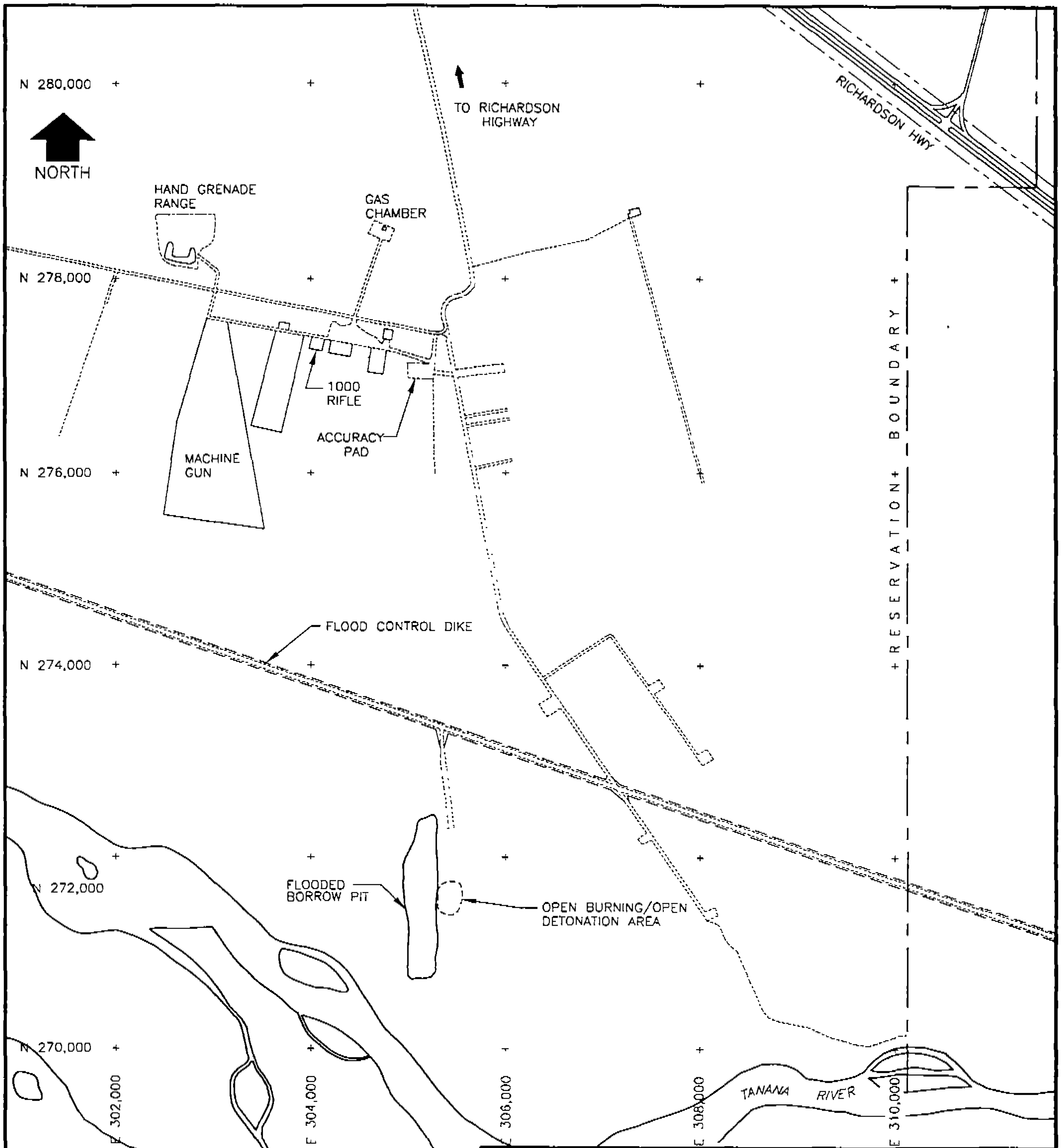


Harding Lawson Associates
Engineering and Environmental Services

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED:
DRAWN: JP
TRACED:
CHECKED: PCR
SUBMITTED:
CHIEF, ARCHITECTURAL SECTION
RECOMMENDED:
CHIEF, MILITARY TECHNICAL ENGINEERING BRANCH
APPROVED:
CHIEF, ENGINEERING DIVISION
DATE: 3/96
SCALE: NOTED
SPEC NO:

OB/OD Area Site Plan

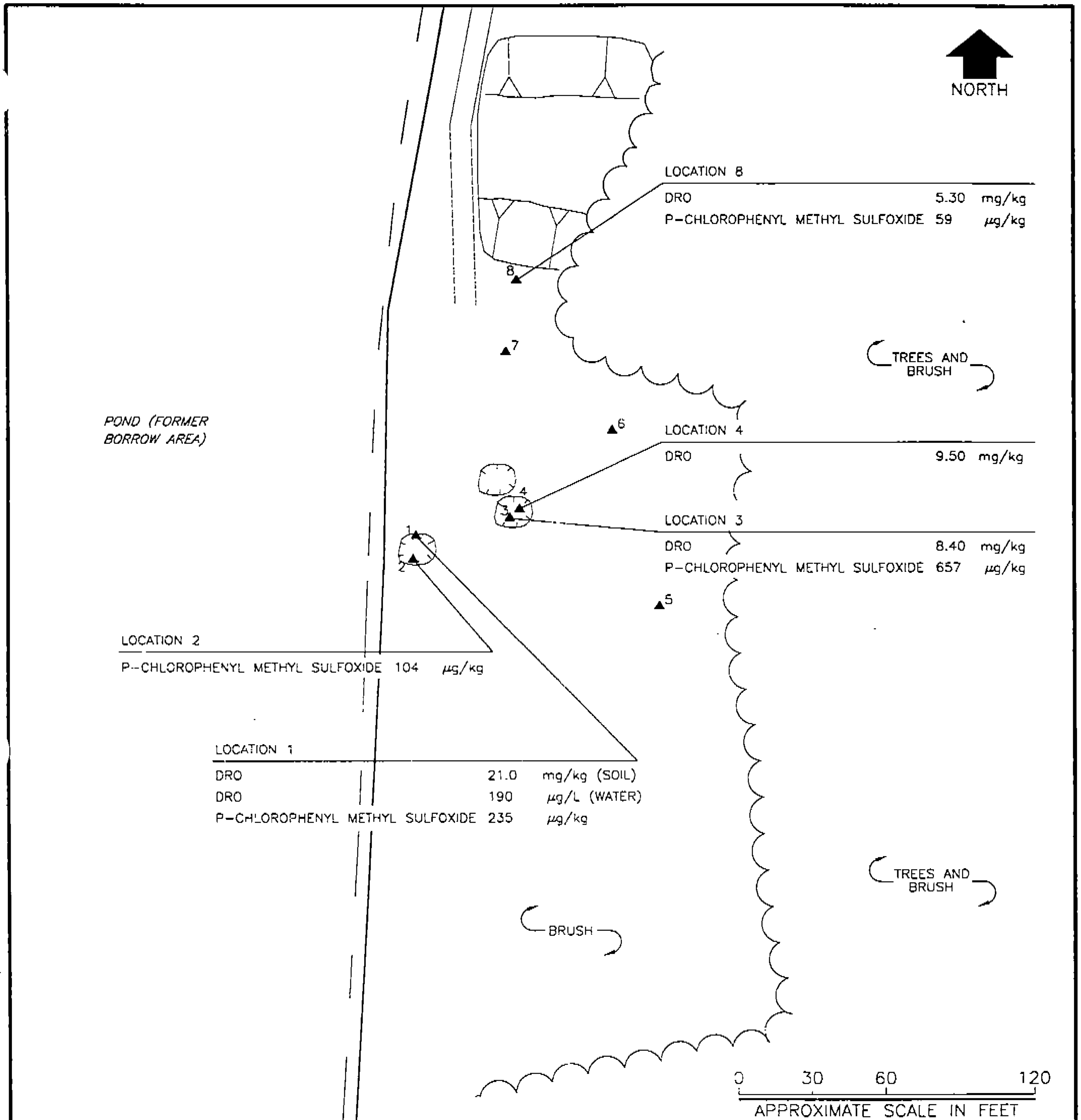
OU 5 Remedial Investigation
Fort Wainwright, Alaska

FIGURE
1-11

REFERENCE: DIRECTOR OF FACILITIES ENGINEERING, AS-BUILT, SQUAD LIVE FIRE ASSAULT RANGE, LOCATION AND VICINITY MAP, DATED 5/81.

875b

68586



LEGEND

▲1	1994 USACE SAMPLING LOCATIONS AND NUMBERS
USACE	U.S. ARMY CORPS OF ENGINEERS
DRO	DIESEL-RANGE ORGANICS
μg/kg	MICROGRAMS PER KILOGRAM
μg/L	MICROGRAMS PER LITER
mg/kg	MILLIGRAMS PER KILOGRAM
◌	DETONATION CRATER

REFERENCE: USACE, 1994. CHEMICAL DATA REPORT, SMALL ARMS RANGE, FORT WAINWRIGHT, ALASKA, FIGURE 3. SAMPLING LOCATIONS, OCTOBER 24.

Harding Lawson Associates
Engineering and Environmental Services

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED
DRAWN BJ
TRACED
CHECKED PCR
SUBMITTED
CHIEF, ARCHITECTURAL SECTION

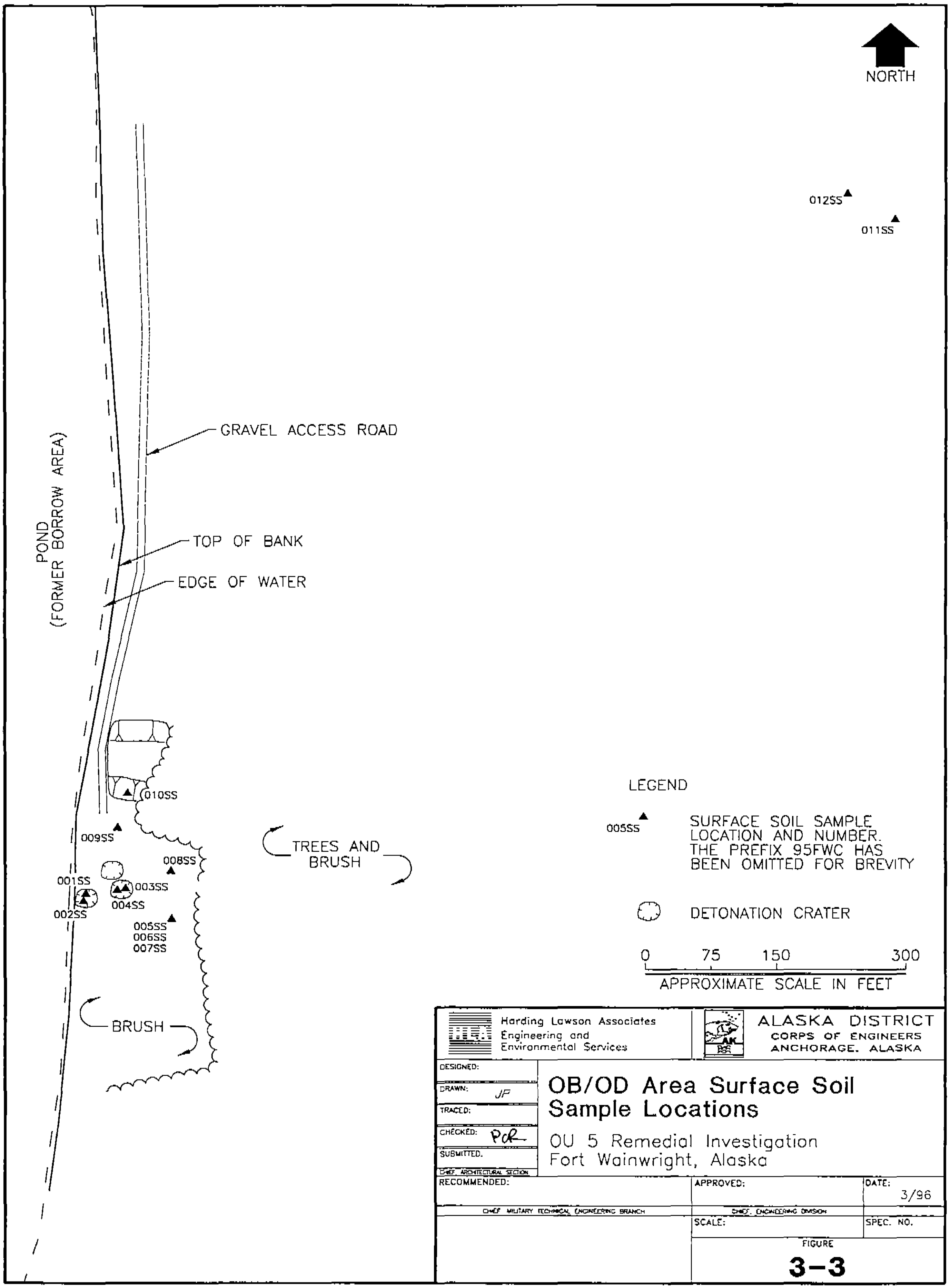
OB/OD Area Chemical Concentrations in Soil and Water

OU 5 Remedial Investigation
Fort Wainwright, Alaska

RECOMMENDED:
CHIEF, MILITARY TECHNICAL ENGINEERING BRANCH
APPROVED:
CHIEF, ENGINEERING DIVISION
DATE: 3/96
SCALE:
SPEC. NO.
FIGURE
1-12

876b

68587



Harding Lawson Associates
Engineering and Environmental Services

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED:
DRAWN: JF
TRACED:
CHECKED: PCR
SUBMITTED:
CHIEF, ARCHITECTURAL SECTION

OB/OD Area Surface Soil Sample Locations

OU 5 Remedial Investigation
Fort Wainwright, Alaska

RECOMMENDED:
CHIEF, MILITARY TECHNICAL ENGINEERING BRANCH
APPROVED:
CHIEF, ENGINEERING DIVISION
DATE: 3/96
SCALE:
SPEC. NO.
FIGURE
3-3

876b

68620

Table 6-15. Concentration Ranges and Detection Frequencies of Analytes in Surface-Water Samples from East QFS Area

Chemicals	Units	Detection Frequency	Range of Detected Concentrations
Volatile Organic Compounds			
Acetone	µg/L	2/24	5.2 - 5.6
2-Butanone	µg/L	11/24	4 - 5.2
Semivolatile Organic Compounds			
Benzyl butyl phthalate	µg/L	3/24	0.84 - 14
Bis(2-ethylhexyl) phthalate	µg/L	1/24	4.5
Di-n-butyl phthalate	µg/L	17/24	2.7 - 46
Metals			
Arsenic, Dissolved	µg/L	1/24	0.9
Barium, Dissolved	µg/L	24/24	26 - 29
Barium, Total	µg/L	23/24	28 - 33
Cadmium, Dissolved	µg/L	4/24	0.47 - 2.8
Cadmium, Total	µg/L	1/24	0.26
Lead, Dissolved	µg/L	19/24	0.59 - 69
Lead, Total	µg/L	24/24	2.3 - 12

µg/L Micrograms per liter

Table 6-16. Concentration Ranges and Detection Frequencies of Analytes Detected in Soil Samples from OB/OD Area

Chemical	Units	Detection Frequency	Range of Detected Concentrations
Metals			
Silver	mg/kg	6/10	0.6 - 0.9
Barium	mg/kg	10/10	85 - 210
Cadmium	mg/kg	4/10	0.6 - 0.8
Chromium	mg/kg	10/10	14 - 36
Vanadium	mg/kg	10/10	27 - 60
Arsenic	mg/kg	10/10	4 - 15
Lead	mg/kg	10/10	7 - 32
Mercury	mg/kg	8/10	0.06 - 1

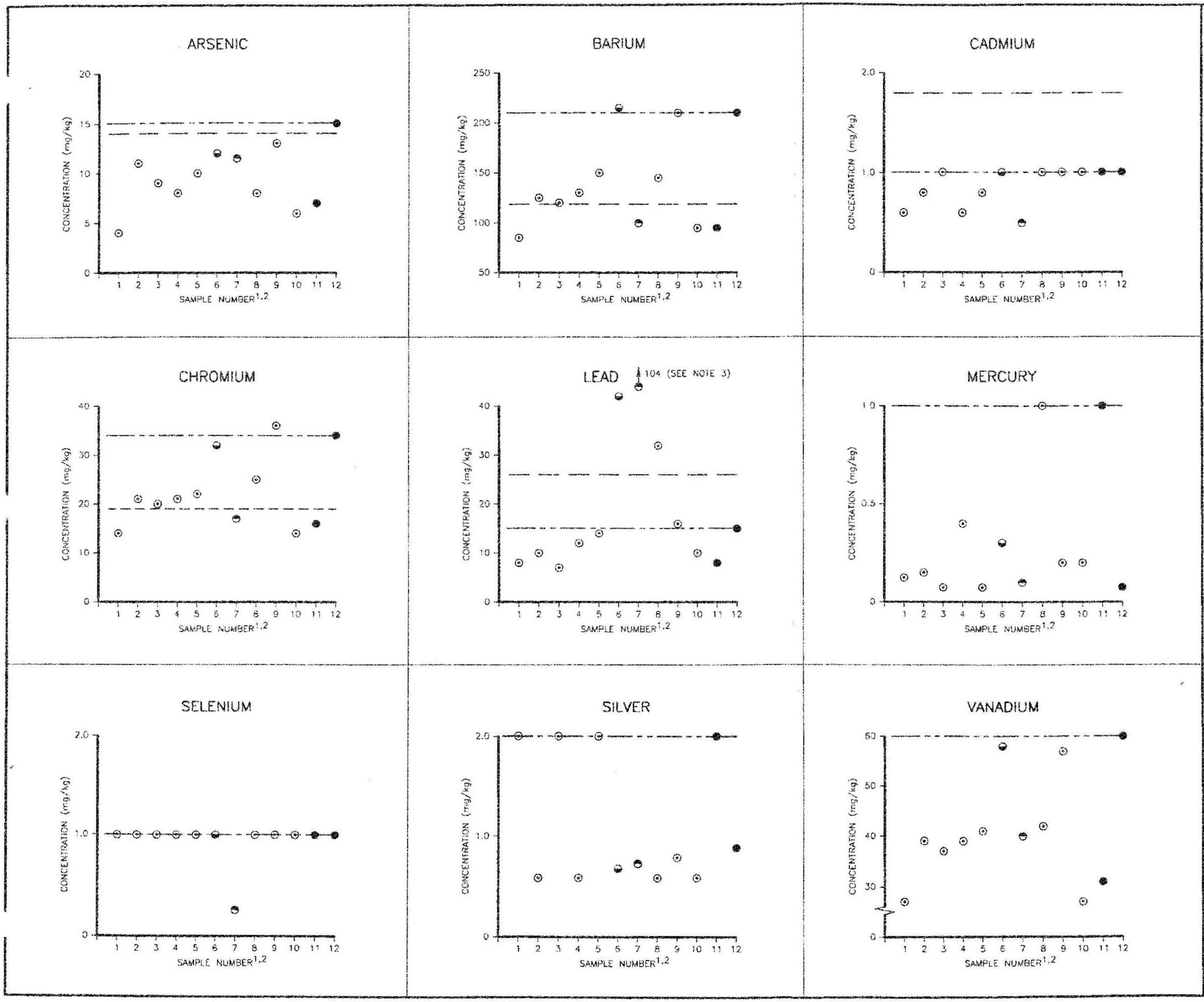
mg/kg Milligrams per kilogram

Table 7-1. Comparison of Metals Concentrations in Surface-Soil Samples at the OB/OD Area to Background Concentrations

Analyte	Units	Maximum Detected Surface Soil Concentration[a]	Background Levels: Site Specific[b] Maximum	Background Levels: Fort Wainwright[c] Mean	Background Levels: Fort Wainwright[c] Maximum[d]	Exceeds Background (Y/N)
Arsenic	mg/kg	15	15	8	14	N
Barium	mg/kg	214	210	85	115	Y
Cadmium	mg/kg	0.8	ND(1)	1	1.8	N
Chromium	mg/kg	36	34	15	19	Y
Lead	mg/kg	42	15	11	26	Y
Mercury	mg/kg	1	1	NA	NA	N
Selenium	mg/kg	ND(1)	ND(1)	NA	NA	N
Silver	mg/kg	0.8	ND(2)	NA	NA	N
Vanadium	mg/kg	57	60	NA	NA	N

mg/kg Milligrams per kilogram
NA Not available
ND Not detected at or above method reporting limit shown in parentheses

a. Does not include quality assurance (QA) sample results.
b. From background samples collected during the Operable Unit 5 Remedial Investigation.
c. USACE. 1994a. *Background data analysis for arsenic, barium, cadmium, chromium, and lead on Fort Wainwright, Alaska* (final), Table 1-9, Soil South of Chena River, March.
d. Mean plus one standard deviation.



EXPLANATION

- OB/OD SAMPLE
- OB/OD QUALITY CONTROL (QC) DUPLICATE SAMPLE
- OB/OD QUALITY ASSURANCE (QA) SAMPLE
- BACKGROUND SAMPLE
- MAXIMUM RECOMMENDED BACKGROUND VALUES FOR FORT WAINWRIGHT, SOUTH OF CHENA RIVER (USACE, 1994)
- MAXIMUM SITE-SPECIFIC BACKGROUND VALUES

NOTES

1. THE SAMPLE NUMBER PREFIX 95FWC AND SUFFIX SS HAVE BEEN OMITTED FOR BREVITY.
2. SAMPLES 6 AND 7 ARE QC AND QA DUPLICATES OF SAMPLE 5.
3. ACCORDING TO THE USACE CHEMICAL QUALITY ASSURANCE REPORT (CQAR) FOR THE OB/OD AREA SAMPLES THE TOTAL LEAD MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD) LABORATORY RECOVERIES WERE NOT CALCULABLE, SINCE THE SAMPLE CONCENTRATION WAS GREATER THAN FOUR TIMES THE SPIKE CONCENTRATION. THE CQAR STATES THAT THE QA DATA FOR TOTAL LEAD SHOULD BE CONSIDERED AN ESTIMATE "BASED ON INTERNAL LABORATORY QC FAILURE."
4. SAMPLE LOCATIONS SHOWN ON FIGURE 3-3.

Harding Lawson Associates
Engineering and Environmental Services

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED:
DRAWN: JP
TRACED:
CHECKED: PCR
SUBMITTED:

Comparison of Metals Concentrations in Surface-Soil Samples at the OB/OD Area to Background Concentrations

OU 5 Remedial Investigation
Fort Wainwright, Alaska

RECOMMENDED:
APPROVED: 3/96
SCALE:
SPEC. NO.
FIGURE
7-1

68712

ATTACHMENT 12

OU-6 Extent of Contamination, Source Removal Areas, and IC Boundaries

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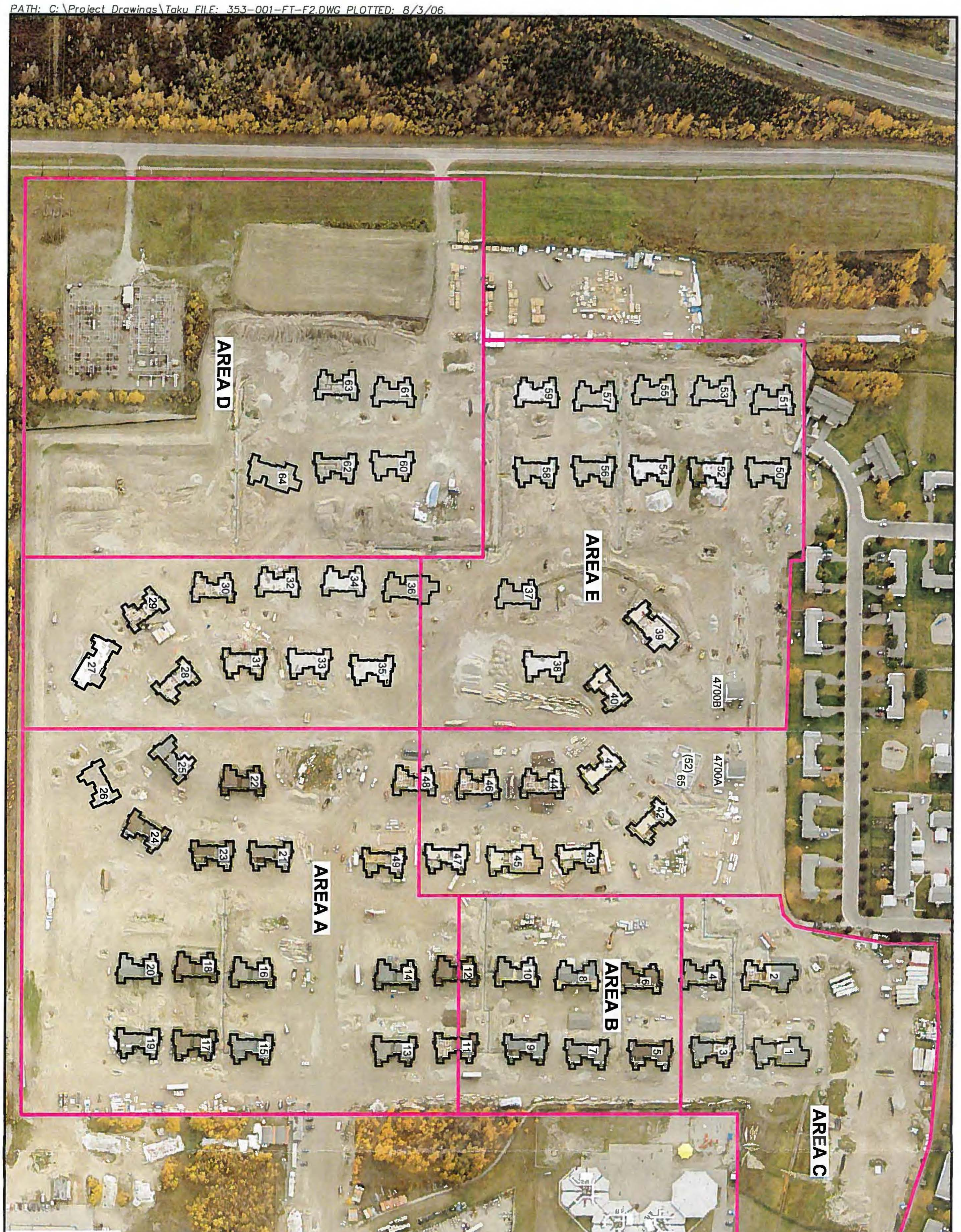

DATE AUGUST 2006 CHKD G.M.B. DRAWN C.E.H. PROJ. NO 353-001	oasis ENVIRONMENTAL 825 W. 8TH AVENUE, SUITE 200 ANCHORAGE, ALASKA 99501	**SOURCE AREAS** PRELIMINARY SOURCE EVALUATION NARRATIVE REPORT TAKU FAMILY HOUSING SITE Fort Wainwright, Alaska	APPENDIX C

Operable Unit 6

Former Hoppe's Slough

Building Not Built

Building

Building with Observed Debris Beneath Foundation

Building with Possible Debris Beneath Foundation

N

All Locations Are Approximate

0 100 200 300 400

Feet

WGS 1984 UTM Zone 6N

Sources:
1. Imagery - U.S. Army Corps of Engineers, 2012
2. USACE. 2010 (December). *Final Remedial Investigation, FWA 102 Former Communications Site, Fort Wainwright, Alaska.*

OPERABLE UNIT 6
BUILDINGS WITH POSSIBLE DEBRIS BENEATH FOUNDATION

FORT WAINWRIGHT, FAIRBANKS, ALASKA

JACOBS	DATE: 08 APR 2015	PROJECT MANAGER: S. RICHMOND	FIGURE NO: A-5

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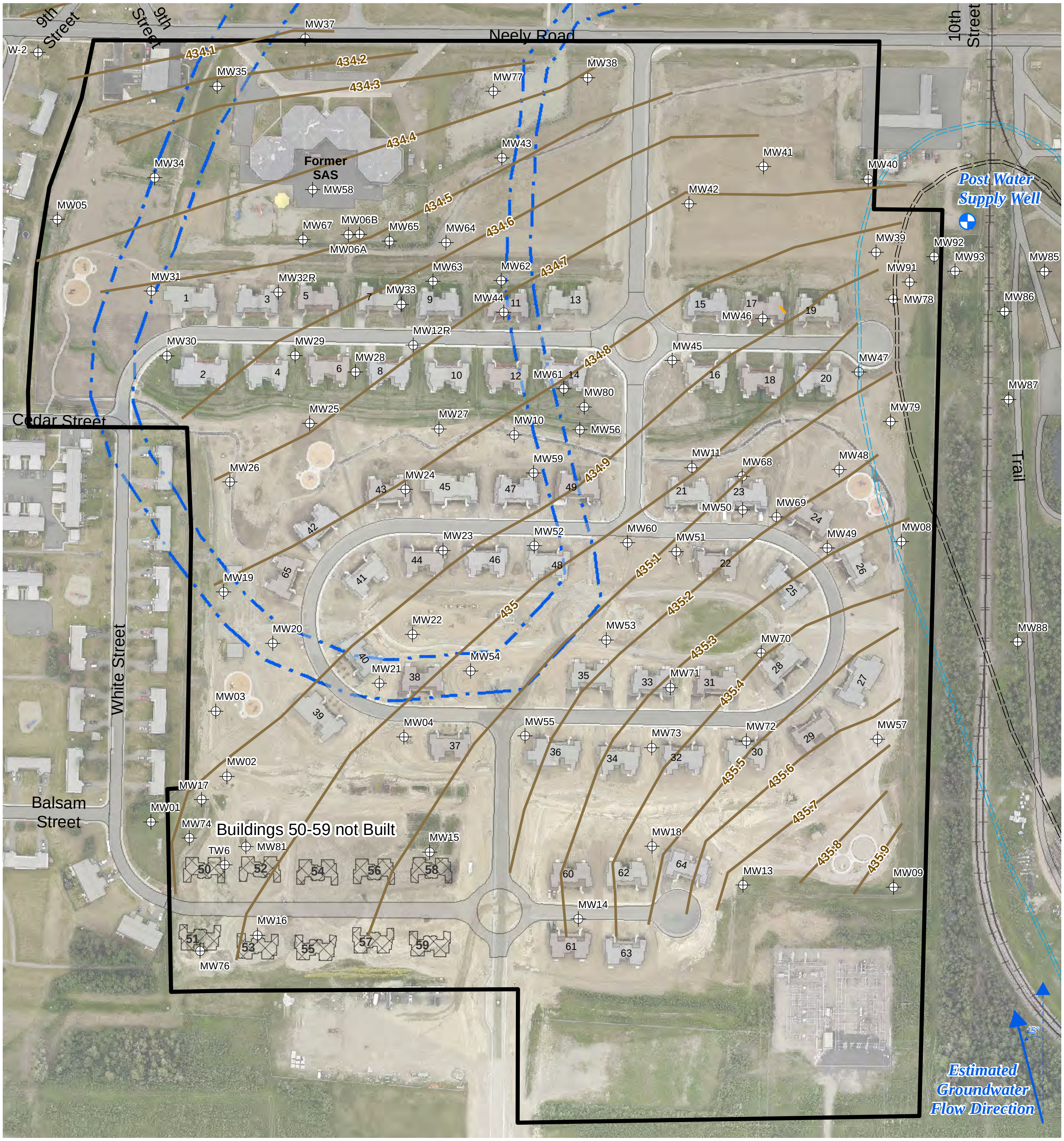

Post Water Supply Well

Building not Built

Former Hoppe's Slough

Elevation Contour

Operable Unit 6

1,000 gpm Pumping Rate Water Supply Capture Zone

1,700 gpm Pumping Rate Water Supply Capture Zone

Monitoring Well

N

All Locations Are Approximate

0 100 200 300 400

Feet

WGS 1984 UTM Zone 6N

Sources:
1. Imagery - U.S. Army Corps of Engineers, May 2012
2. USACE. 2010 (December). *Final Remedial Investigation, FWA 102 Former Communications Site, Fort Wainwright, Alaska.*

OPERABLE UNIT 6
GROUNDWATER ELEVATION CONTOUR MAP

FORT WAINWRIGHT, FAIRBANKS, ALASKA

JACOBS	DATE:	PROJECT MANAGER:	FIGURE NO:
	12 MAR 2015	S. RICHMOND	A-6

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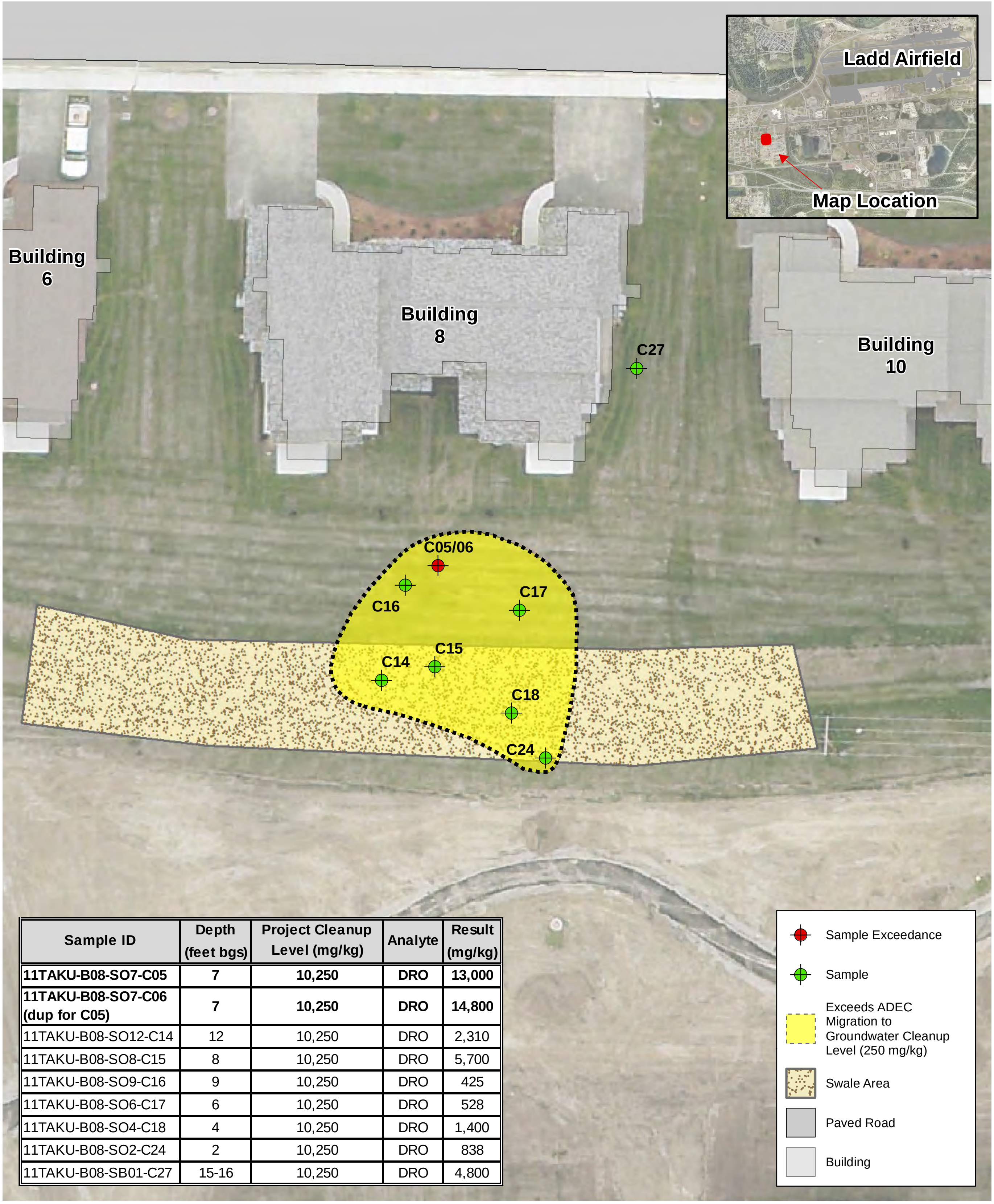

Sample ID	Depth (feet bgs)	Project Cleanup Level (mg/kg)	Analyte	Result (mg/kg)
11TAKU-B08-SO7-C05	**7**	**10,250**	**DRO**	**13,000**
11TAKU-B08-SO7-C06 (dup for C05)	**7**	**10,250**	**DRO**	**14,800**
11TAKU-B08-SO12-C14	12	10,250	DRO	2,310
11TAKU-B08-SO8-C15	8	10,250	DRO	5,700
11TAKU-B08-SO9-C16	9	10,250	DRO	425
11TAKU-B08-SO6-C17	6	10,250	DRO	528
11TAKU-B08-SO4-C18	4	10,250	DRO	1,400
11TAKU-B08-SO2-C24	2	10,250	DRO	838
11TAKU-B08-SB01-C27	15-16	10,250	DRO	4,800

All Locations Are Approximate

N

0 10 20 30 40

Feet

UTM, Z6N

Imagery: U.S. Army Corps of Engineers, May 2012

OPERABLE UNIT 6 - BUILDING 08
DISTRIBUTION OF DIESEL RANGE ORGANICS IN SUBSURFACE SOIL

FORT WAINWRIGHT, FAIRBANKS, ALASKA

JACOBS

DATE: 12 MAR 2015

PROJECT MANAGER: S. RICHMOND

FIGURE NO: A-7

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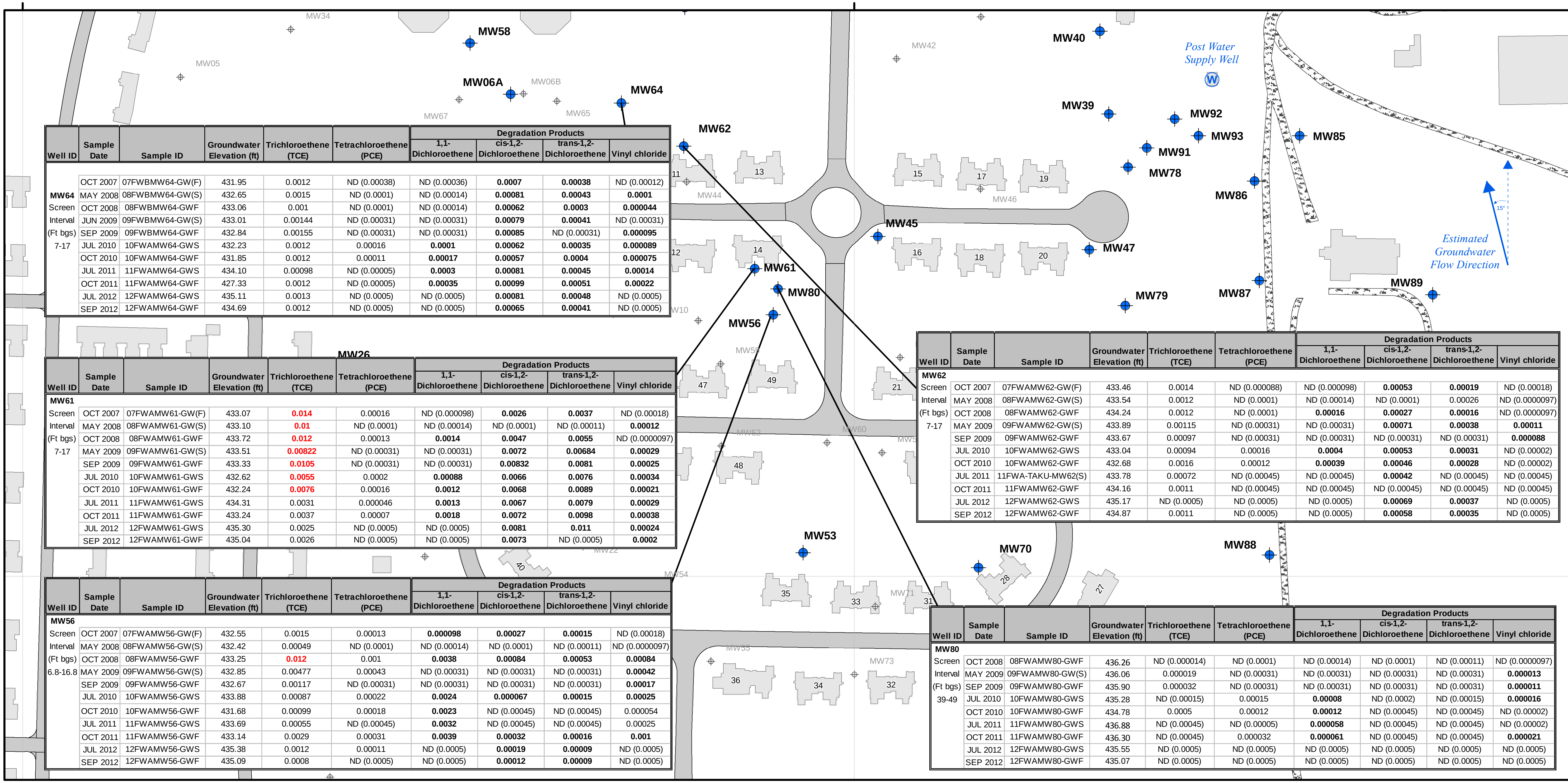


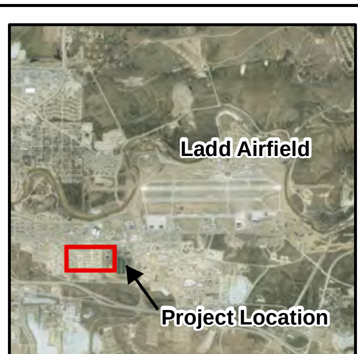
Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	Trichloroethene (TCE)	Tetrachloroethene (PCE)	Degradation Products: 1,1-Dichloroethene	Degradation Products: cis-1,2-Dichloroethene	Degradation Products: trans-1,2-Dichloroethene	Degradation Products: Vinyl chloride
	OCT 2007	07FWBMW64-GW(F)	431.95	0.0012	ND (0.00038)	ND (0.00036)	**0.0007**	**0.00038**	ND (0.00012)
MW64	MAY 2008	08FWBMW64-GW(S)	432.65	0.0015	ND (0.0001)	ND (0.00014)	**0.00081**	**0.00043**	**0.0001**
Screen	OCT 2008	08FWBMW64-GWF	433.06	0.001	ND (0.0001)	ND (0.00014)	**0.00062**	**0.0003**	**0.000044**
Interval	JUN 2009	09FWBMW64-GW(S)	433.01	0.00144	ND (0.00031)	ND (0.00031)	**0.00079**	**0.00041**	ND (0.00031)
(Ft bgs)	SEP 2009	09FWBMW64-GWF	432.84	0.00155	ND (0.00031)	ND (0.00031)	**0.00085**	ND (0.00031)	**0.000095**
7-17	JUL 2010	10FWAMW64-GWS	432.23	0.0012	0.00016	**0.0001**	**0.00062**	**0.00035**	**0.000089**
	OCT 2010	10FWAMW64-GWF	431.85	0.0012	0.00011	**0.00017**	**0.00057**	**0.0004**	**0.000075**
	JUL 2011	11FWAMW64-GWS	434.10	0.00098	ND (0.00005)	**0.0003**	**0.00081**	**0.00045**	**0.00014**
	OCT 2011	11FWAMW64-GWF	427.33	0.0012	ND (0.00005)	**0.00035**	**0.00099**	**0.00051**	**0.00022**
	JUL 2012	12FWAMW64-GWS	435.11	0.0013	ND (0.0005)	ND (0.0005)	**0.00081**	**0.00048**	ND (0.0005)
	SEP 2012	12FWAMW64-GWF	434.69	0.0012	ND (0.0005)	ND (0.0005)	**0.00065**	**0.00041**	ND (0.0005)

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	Trichloroethene (TCE)	Tetrachloroethene (PCE)	Degradation Products: 1,1-Dichloroethene	Degradation Products: cis-1,2-Dichloroethene	Degradation Products: trans-1,2-Dichloroethene	Degradation Products: Vinyl chloride
MW61									
Screen	OCT 2007	07FWAMW61-GW(F)	433.07	**0.014**	0.00016	ND (0.000098)	**0.0026**	**0.0037**	ND (0.00018)
Interval	MAY 2008	08FWAMW61-GW(S)	433.10	**0.01**	ND (0.0001)	ND (0.00014)	ND (0.0001)	ND (0.00011)	**0.00012**
(Ft bgs)	OCT 2008	08FWAMW61-GWF	433.72	**0.012**	0.00013	**0.0014**	**0.0047**	**0.0055**	ND (0.0000097)
7-17	MAY 2009	09FWAMW61-GW(S)	433.51	**0.00822**	ND (0.00031)	ND (0.00031)	**0.0072**	**0.00684**	**0.00029**
	SEP 2009	09FWAMW61-GWF	433.33	**0.0105**	ND (0.00031)	ND (0.00031)	**0.00832**	**0.0081**	**0.00025**
	JUL 2010	10FWAMW61-GWS	432.62	**0.0055**	0.0002	**0.00088**	**0.0066**	**0.0076**	**0.00034**
	OCT 2010	10FWAMW61-GWF	432.24	**0.0076**	0.00016	**0.0012**	**0.0068**	**0.0089**	**0.00021**
	JUL 2011	11FWAMW61-GWS	434.31	0.0031	0.000046	**0.0013**	**0.0067**	**0.0079**	**0.00029**
	OCT 2011	11FWAMW61-GWF	433.24	0.0037	0.00007	**0.0018**	**0.0072**	**0.0098**	**0.00038**
	JUL 2012	12FWAMW61-GWS	435.30	0.0025	ND (0.0005)	ND (0.0005)	**0.0081**	**0.011**	**0.00024**
	SEP 2012	12FWAMW61-GWF	435.04	0.0026	ND (0.0005)	ND (0.0005)	**0.0073**	ND (0.0005)	**0.0002**

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	Trichloroethene (TCE)	Tetrachloroethene (PCE)	Degradation Products: 1,1-Dichloroethene	Degradation Products: cis-1,2-Dichloroethene	Degradation Products: trans-1,2-Dichloroethene	Degradation Products: Vinyl chloride
MW56									
Screen	OCT 2007	07FWAMW56-GW(F)	432.55	0.0015	0.00013	**0.000098**	**0.00027**	**0.00015**	ND (0.00018)
Interval	MAY 2008	08FWAMW56-GW(S)	432.42	0.00049	ND (0.0001)	ND (0.00014)	ND (0.0001)	ND (0.00011)	ND (0.0000097)
(Ft bgs)	OCT 2008	08FWAMW56-GWF	433.25	**0.012**	0.001	**0.0038**	**0.00084**	**0.00053**	**0.00084**
6.8-16.8	MAY 2009	09FWAMW56-GW(S)	432.85	0.00477	0.00043	ND (0.00031)	ND (0.00031)	ND (0.00031)	**0.00042**
	SEP 2009	09FWAMW56-GWF	432.67	0.00117	ND (0.00031)	ND (0.00031)	ND (0.00031)	ND (0.00031)	**0.00017**
	JUL 2010	10FWAMW56-GWS	433.88	0.00087	0.00022	**0.0024**	**0.000067**	**0.00015**	**0.00025**
	OCT 2010	10FWAMW56-GWF	431.68	0.00099	0.00018	**0.0023**	ND (0.00045)	ND (0.00045)	0.000054
	JUL 2011	11FWAMW56-GWS	433.69	0.00055	ND (0.00045)	**0.0032**	ND (0.00045)	ND (0.00045)	0.00025
	OCT 2011	11FWAMW56-GWF	433.14	0.0029	0.00031	**0.0039**	**0.00032**	**0.00016**	**0.001**
	JUL 2012	12FWAMW56-GWS	435.38	0.0012	0.00011	ND (0.0005)	**0.00019**	**0.00009**	ND (0.0005)
	SEP 2012	12FWAMW56-GWF	435.09	0.0008	ND (0.0005)	ND (0.0005)	**0.00012**	**0.00009**	ND (0.0005)

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	Trichloroethene (TCE)	Tetrachloroethene (PCE)	Degradation Products: 1,1-Dichloroethene	Degradation Products: cis-1,2-Dichloroethene	Degradation Products: trans-1,2-Dichloroethene	Degradation Products: Vinyl chloride
MW62									
Screen	OCT 2007	07FWAMW62-GW(F)	433.46	0.0014	ND (0.000088)	ND (0.000098)	**0.00053**	**0.00019**	ND (0.00018)
Interval	MAY 2008	08FWAMW62-GW(S)	433.54	0.0012	ND (0.0001)	ND (0.00014)	ND (0.0001)	0.00026	ND (0.0000097)
(Ft bgs)	OCT 2008	08FWAMW62-GWF	434.24	0.0012	ND (0.0001)	**0.00016**	**0.00027**	**0.00016**	ND (0.0000097)
7-17	MAY 2009	09FWAMW62-GW(S)	433.89	0.00115	ND (0.00031)	ND (0.00031)	**0.00071**	**0.00038**	**0.00011**
	SEP 2009	09FWAMW62-GWF	433.67	0.00097	ND (0.00031)	ND (0.00031)	ND (0.00031)	ND (0.00031)	**0.000088**
	JUL 2010	10FWAMW62-GWS	433.04	0.00094	0.00016	**0.0004**	**0.00053**	**0.00031**	ND (0.00002)
	OCT 2010	10FWAMW62-GWF	432.68	0.0016	0.00012	**0.00039**	**0.00046**	**0.00028**	ND (0.00002)
	JUL 2011	11FWA-TAKU-MW62(S)	433.78	0.00072	ND (0.00045)	ND (0.00045)	**0.00042**	ND (0.00045)	ND (0.00045)
	OCT 2011	11FWAMW62-GWF	434.16	0.0011	ND (0.00045)	ND (0.00045)	ND (0.00045)	ND (0.00045)	ND (0.00045)
	JUL 2012	12FWAMW62-GWS	435.17	ND (0.0005)	ND (0.0005)	ND (0.0005)	**0.00069**	**0.00037**	ND (0.0005)
	SEP 2012	12FWAMW62-GWF	434.87	0.0011	ND (0.0005)	ND (0.0005)	**0.00058**	**0.00035**	ND (0.0005)

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	Trichloroethene (TCE)	Tetrachloroethene (PCE)	Degradation Products: 1,1-Dichloroethene	Degradation Products: cis-1,2-Dichloroethene	Degradation Products: trans-1,2-Dichloroethene	Degradation Products: Vinyl chloride
MW80									
Screen	OCT 2008	08FWAMW80-GWF	436.26	ND (0.000014)	ND (0.0001)	ND (0.00014)	ND (0.0001)	ND (0.00011)	ND (0.0000097)
Interval	MAY 2009	09FWAMW80-GW(S)	436.06	0.000019	ND (0.00031)	ND (0.00031)	ND (0.00031)	ND (0.00031)	**0.000013**
(Ft bgs)	SEP 2009	09FWAMW80-GWF	435.90	0.000032	ND (0.00031)	ND (0.00031)	ND (0.00031)	ND (0.00031)	**0.000011**
39-49	JUL 2010	10FWAMW80-GWS	435.28	ND (0.00015)	0.00015	**0.00008**	ND (0.0002)	ND (0.00015)	**0.000016**
	OCT 2010	10FWAMW80-GWF	434.78	0.0005	0.00012	**0.00012**	ND (0.00045)	ND (0.00045)	ND (0.00002)
	JUL 2011	11FWAMW80-GWS	436.88	ND (0.00045)	ND (0.00005)	**0.000058**	ND (0.00045)	ND (0.00045)	ND (0.00002)
	OCT 2011	11FWAMW80-GWF	436.30	ND (0.00045)	0.000032	**0.000061**	ND (0.00045)	ND (0.00045)	**0.000021**
	JUL 2012	12FWAMW80-GWS	435.55	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)
	SEP 2012	12FWAMW80-GWF	435.07	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)



2012 Sampled Well - TCE Exceedance

2012 Sampled Well - No TCE Exceedance

Onsite Well

Post Water Supply Well

Notes:
Units: mg/L
ND: not detected
Ft bgs: feet below ground surface
Trichloroethene (TCE) Project Cleanup Level = 0.005 mg/L
cis-1,2-Dichloroethene Project Cleanup Level = 0.07 mg/L
1,1-Dichloroethene Project Cleanup Level = 0.007 mg/L
trans-1,2-Dichloroethene Project Cleanup Level = 0.1 mg/L
Vinyl chloride Project Cleanup Level = 0.002 mg/L
Tetrachloroethene (PCE) Project Cleanup Level = 0.005 mg/L

The F or S at the end of the sample ID indicates the Spring or Fall sampling event.
(F) or (S) is appended to the sample ID where the original sample ID did not include an F or an S.
Results are presented without qualifiers.
RED exceeded the project cleanup level.
BOLD detections of degradation products.

All Locations Are Approximate

0 150 300 450 600
Feet

WGS 1984 UTM Zone 6N

OPERABLE UNIT 6 (SOUTH) TRICHLOROETHENE (TCE) RESULTS FOR IN-PLUME AND SURROUNDING WELLS

FORT WAINWRIGHT, FAIRBANKS, ALASKA

JACOBS

DATE: 08 APR 2015

PROJECT MANAGER: S. RICHMOND

FIGURE NO: A-8

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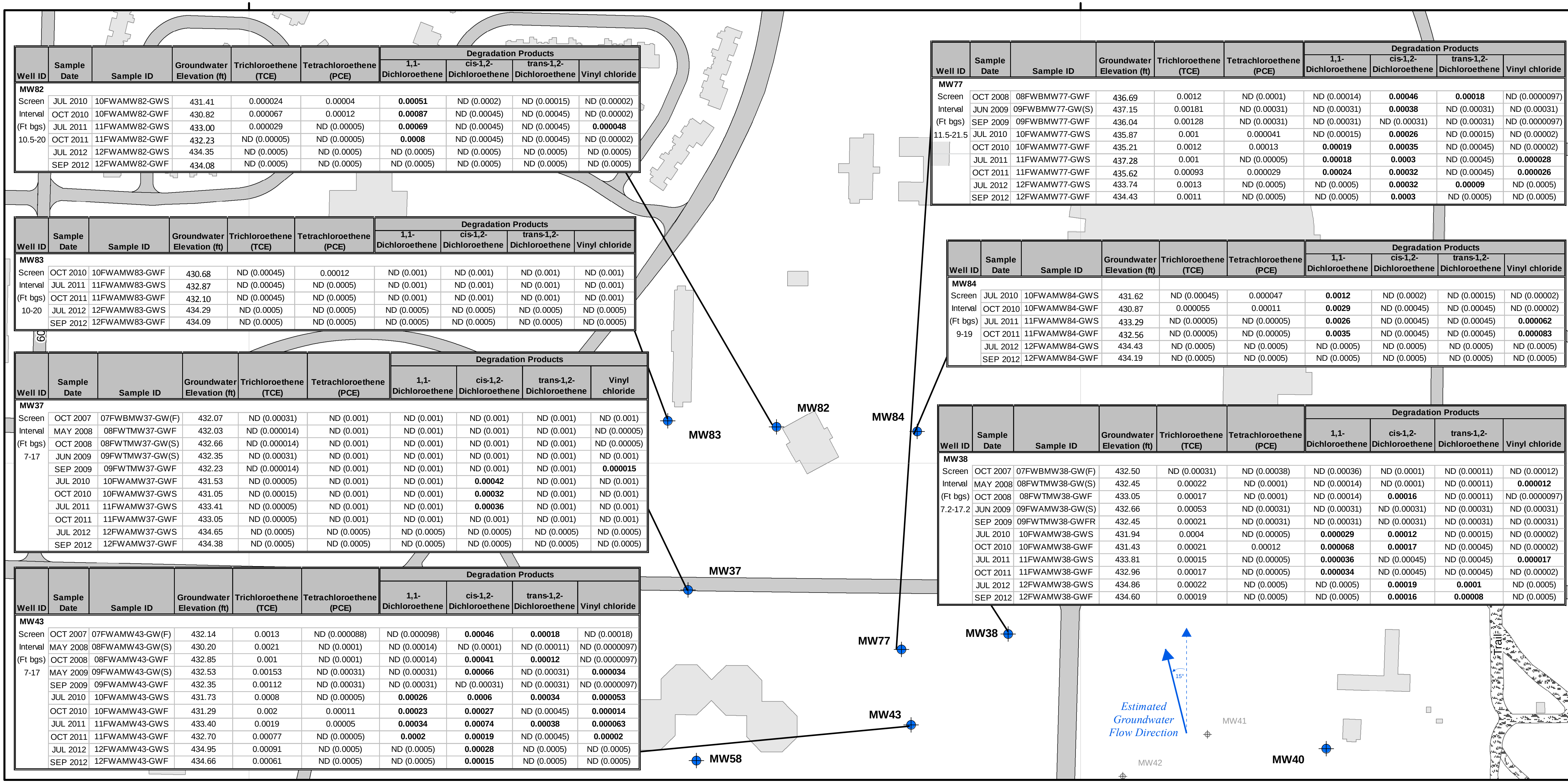


Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	Trichloroethene (TCE)	Tetrachloroethene (PCE)	Degradation Products: 1,1-Dichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Vinyl chloride
MW82									
Screen	JUL 2010	10FWAMW82-GWS	431.41	0.000024	0.00004	**0.00051**	ND (0.0002)	ND (0.00015)	ND (0.00002)
Interval	OCT 2010	10FWAMW82-GWF	430.82	0.000067	0.00012	**0.00087**	ND (0.00045)	ND (0.00045)	ND (0.00002)
(Ft bgs)	JUL 2011	11FWAMW82-GWS	433.00	0.000029	ND (0.00005)	**0.00069**	ND (0.00045)	ND (0.00045)	**0.000048**
10.5-20	OCT 2011	11FWAMW82-GWF	432.23	ND (0.00005)	ND (0.00005)	**0.0008**	ND (0.00045)	ND (0.00045)	ND (0.00002)
	JUL 2012	12FWAMW82-GWS	434.35	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)
	SEP 2012	12FWAMW82-GWF	434.08	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	Trichloroethene (TCE)	Tetrachloroethene (PCE)	Degradation Products: 1,1-Dichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Vinyl chloride
MW83									
Screen	OCT 2010	10FWAMW83-GWF	430.68	ND (0.00045)	0.00012	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
Interval	JUL 2011	11FWAMW83-GWS	432.87	ND (0.00045)	ND (0.0005)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
(Ft bgs)	OCT 2011	11FWAMW83-GWF	432.10	ND (0.00045)	ND (0.0005)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
10-20	JUL 2012	12FWAMW83-GWS	434.29	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)
	SEP 2012	12FWAMW83-GWF	434.09	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)

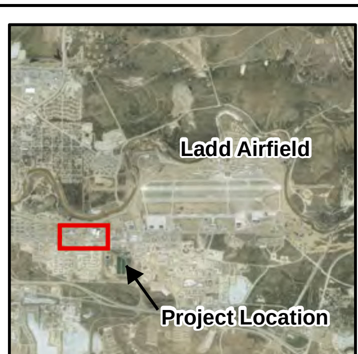
Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	Trichloroethene (TCE)	Tetrachloroethene (PCE)	Degradation Products: 1,1-Dichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Vinyl chloride
MW37									
Screen	OCT 2007	07FWBMW37-GW(F)	432.07	ND (0.00031)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
Interval	MAY 2008	08FWTMW37-GWF	432.03	ND (0.000014)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.00005)
(Ft bgs)	OCT 2008	08FWTMW37-GW(S)	432.66	ND (0.000014)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.00005)
7-17	JUN 2009	09FWTMW37-GW(S)	432.35	ND (0.00031)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
	SEP 2009	09FWTMW37-GWF	432.23	ND (0.000014)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	**0.000015**
	JUL 2010	10FWAMW37-GWF	431.53	ND (0.00005)	ND (0.001)	ND (0.001)	**0.00042**	ND (0.001)	ND (0.001)
	OCT 2010	10FWAMW37-GWS	431.05	ND (0.00015)	ND (0.001)	ND (0.001)	**0.00032**	ND (0.001)	ND (0.001)
	JUL 2011	11FWAMW37-GWS	433.41	ND (0.00005)	ND (0.001)	ND (0.001)	**0.00036**	ND (0.001)	ND (0.001)
	OCT 2011	11FWAMW37-GWF	433.05	ND (0.00005)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
	JUL 2012	12FWAMW37-GWS	434.65	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)
	SEP 2012	12FWAMW37-GWF	434.38	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	Trichloroethene (TCE)	Tetrachloroethene (PCE)	Degradation Products: 1,1-Dichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Vinyl chloride
MW43									
Screen	OCT 2007	07FWAMW43-GW(F)	432.14	0.0013	ND (0.000088)	ND (0.000098)	**0.00046**	**0.00018**	ND (0.00018)
Interval	MAY 2008	08FWAMW43-GW(S)	430.20	0.0021	ND (0.0001)	ND (0.00014)	ND (0.0001)	ND (0.00011)	ND (0.0000097)
(Ft bgs)	OCT 2008	08FWAMW43-GWF	432.85	0.001	ND (0.0001)	ND (0.00014)	**0.00041**	**0.00012**	ND (0.0000097)
7-17	MAY 2009	09FWAMW43-GW(S)	432.53	0.00153	ND (0.00031)	ND (0.00031)	**0.00066**	ND (0.00031)	**0.000034**
	SEP 2009	09FWAMW43-GWF	432.35	0.00112	ND (0.00031)	ND (0.00031)	ND (0.00031)	ND (0.00031)	ND (0.0000097)
	JUL 2010	10FWAMW43-GWS	431.73	0.0008	ND (0.00005)	**0.00026**	**0.0006**	**0.00034**	**0.000053**
	OCT 2010	10FWAMW43-GWF	431.29	0.002	0.00011	**0.00023**	**0.00027**	ND (0.00045)	**0.000014**
	JUL 2011	11FWAMW43-GWS	433.40	0.0019	0.00005	**0.00034**	**0.00074**	**0.00038**	**0.000063**
	OCT 2011	11FWAMW43-GWF	432.70	0.00077	ND (0.00005)	**0.0002**	**0.00019**	ND (0.00045)	**0.00002**
	JUL 2012	12FWAMW43-GWS	434.95	0.00091	ND (0.0005)	ND (0.0005)	**0.00028**	ND (0.0005)	ND (0.0005)
	SEP 2012	12FWAMW43-GWF	434.66	0.00061	ND (0.0005)	ND (0.0005)	**0.00015**	ND (0.0005)	ND (0.0005)

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	Trichloroethene (TCE)	Tetrachloroethene (PCE)	Degradation Products: 1,1-Dichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Vinyl chloride
MW77									
Screen	OCT 2008	08FWBMW77-GWF	436.69	0.0012	ND (0.0001)	ND (0.00014)	**0.00046**	**0.00018**	ND (0.0000097)
Interval	JUN 2009	09FWBMW77-GW(S)	437.15	0.00181	ND (0.00031)	ND (0.00031)	**0.00038**	ND (0.00031)	ND (0.00031)
(Ft bgs)	SEP 2009	09FWBMW77-GWF	436.04	0.00128	ND (0.00031)	ND (0.00031)	ND (0.00031)	ND (0.00031)	ND (0.0000097)
11.5-21.5	JUL 2010	10FWAMW77-GWS	435.87	0.001	0.000041	ND (0.00015)	**0.00026**	ND (0.00015)	ND (0.00002)
	OCT 2010	10FWAMW77-GWF	435.21	0.0012	0.00013	**0.00019**	**0.00035**	ND (0.00045)	ND (0.00002)
	JUL 2011	11FWAMW77-GWS	437.28	0.001	ND (0.00005)	**0.00018**	**0.0003**	ND (0.00045)	**0.000028**
	OCT 2011	11FWAMW77-GWF	435.62	0.00093	0.000029	**0.00024**	**0.00032**	ND (0.00045)	**0.000026**
	JUL 2012	12FWAMW77-GWS	433.74	0.0013	ND (0.0005)	ND (0.0005)	**0.00032**	**0.00009**	ND (0.0005)
	SEP 2012	12FWAMW77-GWF	434.43	0.0011	ND (0.0005)	ND (0.0005)	**0.0003**	ND (0.0005)	ND (0.0005)

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	Trichloroethene (TCE)	Tetrachloroethene (PCE)	Degradation Products: 1,1-Dichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Vinyl chloride
MW84									
Screen	JUL 2010	10FWAMW84-GWS	431.62	ND (0.00045)	0.000047	**0.0012**	ND (0.0002)	ND (0.00015)	ND (0.00002)
Interval	OCT 2010	10FWAMW84-GWF	430.87	0.000055	0.00011	**0.0029**	ND (0.00045)	ND (0.00045)	ND (0.00002)
(Ft bgs)	JUL 2011	11FWAMW84-GWS	433.29	ND (0.00005)	ND (0.00005)	**0.0026**	ND (0.00045)	ND (0.00045)	**0.000062**
9-19	OCT 2011	11FWAMW84-GWF	432.56	ND (0.00005)	ND (0.00005)	**0.0035**	ND (0.00045)	ND (0.00045)	**0.000083**
	JUL 2012	12FWAMW84-GWS	434.43	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)
	SEP 2012	12FWAMW84-GWF	434.19	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	Trichloroethene (TCE)	Tetrachloroethene (PCE)	Degradation Products: 1,1-Dichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Vinyl chloride
MW38									
Screen	OCT 2007	07FWBMW38-GW(F)	432.50	ND (0.00031)	ND (0.00038)	ND (0.00036)	ND (0.0001)	ND (0.00011)	ND (0.00012)
Interval	MAY 2008	08FWTMW38-GW(S)	432.45	0.00022	ND (0.0001)	ND (0.00014)	ND (0.0001)	ND (0.00011)	**0.000012**
(Ft bgs)	OCT 2008	08FWTMW38-GWF	433.05	0.00017	ND (0.0001)	ND (0.00014)	**0.00016**	ND (0.00011)	ND (0.0000097)
7.2-17.2	JUN 2009	09FWAMW38-GW(S)	432.66	0.00053	ND (0.00031)	ND (0.00031)	ND (0.00031)	ND (0.00031)	ND (0.00031)
	SEP 2009	09FWTMW38-GWFR	432.45	0.00021	ND (0.00031)	ND (0.00031)	ND (0.00031)	ND (0.00031)	ND (0.00031)
	JUL 2010	10FWAMW38-GWS	431.94	0.0004	ND (0.00005)	**0.000029**	**0.00012**	ND (0.00015)	ND (0.00002)
	OCT 2010	10FWAMW38-GWF	431.43	0.00021	0.00012	**0.000068**	**0.00017**	ND (0.00045)	ND (0.00002)
	JUL 2011	11FWAMW38-GWS	433.81	0.00015	ND (0.00005)	**0.000036**	ND (0.00045)	ND (0.00045)	**0.000017**
	OCT 2011	11FWAMW38-GWF	432.96	0.00017	ND (0.00005)	**0.000034**	ND (0.00045)	ND (0.00045)	ND (0.00002)
	JUL 2012	12FWAMW38-GWS	434.86	0.00022	ND (0.0005)	ND (0.0005)	**0.00019**	**0.0001**	ND (0.0005)
	SEP 2012	12FWAMW38-GWF	434.60	0.00019	ND (0.0005)	ND (0.0005)	**0.00016**	**0.00008**	ND (0.0005)



2012 Sampled Well - TCE Exceedance

2012 Sampled Well - No TCE Exceedance

Onsite Well

Post Water Supply Well

Notes:
Units: mg/L
ND: not detected
Ft bgs: feet below ground surface
Trichloroethene (TCE) Project Cleanup Level = 0.005 mg/L
cis-1,2-Dichloroethene Project Cleanup Level = 0.07 mg/L
1,1-Dichloroethene Project Cleanup Level = 0.007 mg/L
trans-1,2-Dichloroethene Project Cleanup Level = 0.1 mg/L
Vinyl chloride Project Cleanup Level = 0.002 mg/L
Tetrachloroethene (PCE) Project Cleanup Level = 0.005 mg/L

The F or S at the end of the sample ID indicates the Spring or Fall sampling event.
(F) or (S) is appended to the sample ID where the original sample ID did not include an F or an S.
Results are presented without qualifiers.
RED exceeded the project cleanup level.
BOLD detections of degradation products.

All Locations Are Approximate

0 150 300 450 600
Feet

WGS 1984 UTM Zone 6N

N

OPERABLE UNIT 6 (NORTH)
TRICHLOROETHENE (TCE) RESULTS
FOR IN-PLUME AND SURROUNDING WELLS
FORT WAINWRIGHT, FAIRBANKS, ALASKA

JACOBS	DATE: 08 APR 2015	PROJECT MANAGER: S. RICHMOND	FIGURE NO: A-9

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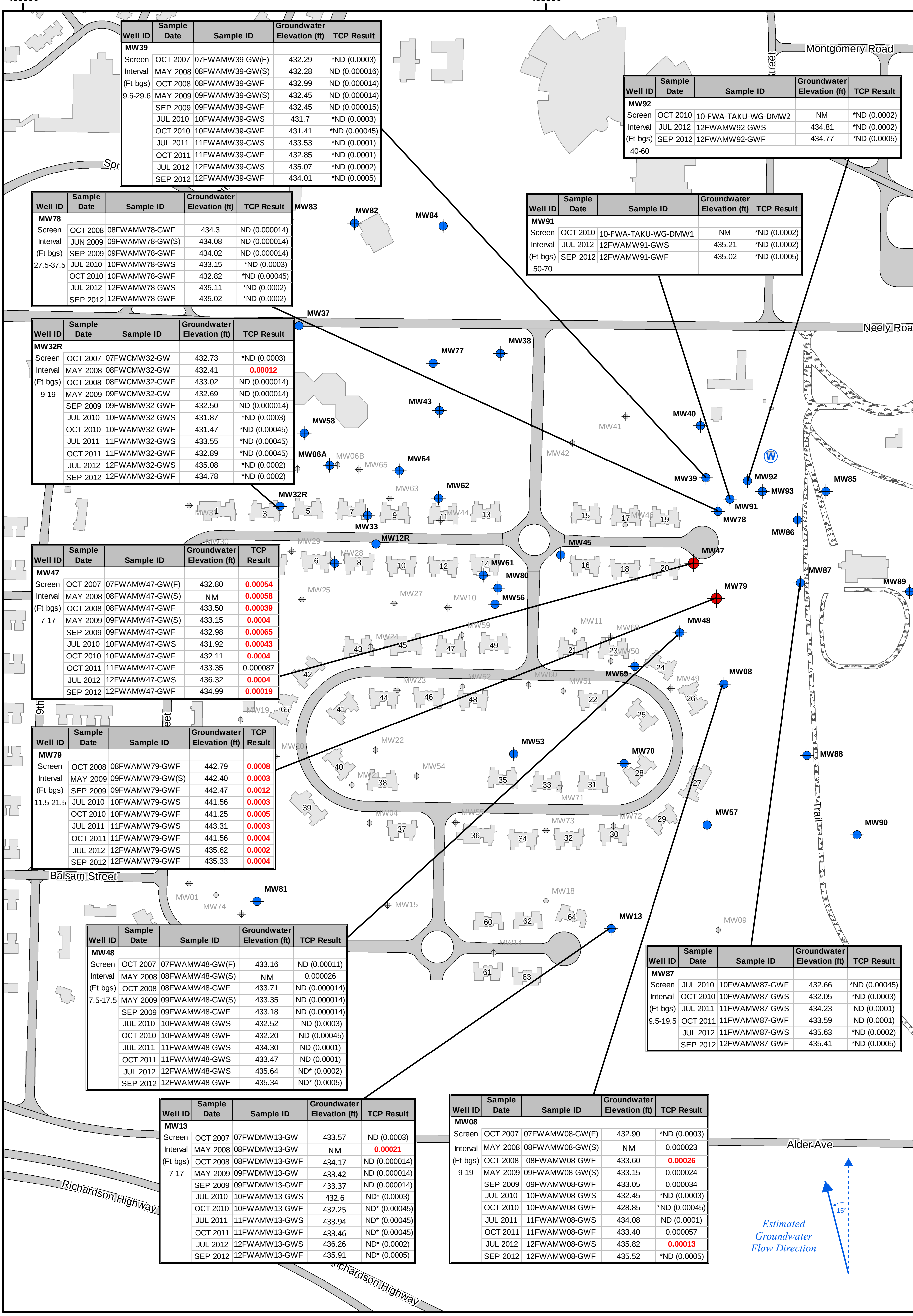


Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	TCP Result
MW39				
Screen	OCT 2007	07FWAMW39-GW(F)	432.29	*ND (0.0003)
Interval	MAY 2008	08FWAMW39-GW(S)	432.28	ND (0.000016)
(Ft bgs)	OCT 2008	08FWAMW39-GWF	432.99	ND (0.000014)
9.6-29.6	MAY 2009	09FWAMW39-GW(S)	432.45	ND (0.000014)
	SEP 2009	09FWAMW39-GWF	432.45	ND (0.000015)
	JUL 2010	10FWAMW39-GWS	431.7	*ND (0.0003)
	OCT 2010	10FWAMW39-GWF	431.41	*ND (0.00045)
	JUL 2011	11FWAMW39-GWS	433.53	*ND (0.0001)
	OCT 2011	11FWAMW39-GWF	432.85	*ND (0.0001)
	JUL 2012	12FWAMW39-GWS	435.07	*ND (0.0002)
	SEP 2012	12FWAMW39-GWF	434.01	*ND (0.0005)

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	TCP Result
MW92				
Screen	OCT 2010	10-FWA-TAKU-WG-DMW2	NM	*ND (0.0002)
Interval	JUL 2012	12FWAMW92-GWS	434.81	*ND (0.0002)
(Ft bgs)	SEP 2012	12FWAMW92-GWF	434.77	*ND (0.0005)
40-60				

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	TCP Result
MW78				
Screen	OCT 2008	08FWAMW78-GWF	434.3	ND (0.000014)
Interval	JUN 2009	09FWAMW78-GW(S)	434.08	ND (0.000014)
(Ft bgs)	SEP 2009	09FWAMW78-GWF	434.02	ND (0.000014)
27.5-37.5	JUL 2010	10FWAMW78-GWS	433.15	*ND (0.0003)
	OCT 2010	10FWAMW78-GWF	432.82	*ND (0.00045)
	JUL 2012	12FWAMW78-GWS	435.11	*ND (0.0002)
	SEP 2012	12FWAMW78-GWF	435.02	*ND (0.0002)

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	TCP Result
MW91				
Screen	OCT 2010	10-FWA-TAKU-WG-DMW1	NM	*ND (0.0002)
Interval	JUL 2012	12FWAMW91-GWS	435.21	*ND (0.0002)
(Ft bgs)	SEP 2012	12FWAMW91-GWF	435.02	*ND (0.0005)
50-70				

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	TCP Result
MW32R				
Screen	OCT 2007	07FWCMW32-GW	432.73	*ND (0.0003)
Interval	MAY 2008	08FWCMW32-GW	432.41	0.00012
(Ft bgs)	OCT 2008	08FWCMW32-GWF	433.02	ND (0.000014)
9-19	MAY 2009	09FWCMW32-GW	432.69	ND (0.000014)
	SEP 2009	09FWBMW32-GWF	432.50	ND (0.000014)
	JUL 2010	10FWAMW32-GWS	431.87	*ND (0.0003)
	OCT 2010	10FWAMW32-GWF	431.47	*ND (0.00045)
	JUL 2011	11FWAMW32-GWS	433.55	*ND (0.00045)
	OCT 2011	11FWAMW32-GWF	432.89	*ND (0.00045)
	JUL 2012	12FWAMW32-GWS	435.08	*ND (0.0002)
	SEP 2012	12FWAMW32-GWF	434.78	*ND (0.0002)

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	TCP Result
MW47				
Screen	OCT 2007	07FWAMW47-GW(F)	432.80	0.00054
Interval	MAY 2008	08FWAMW47-GW(S)	NM	0.00058
(Ft bgs)	OCT 2008	08FWAMW47-GWF	433.50	0.00039
7-17	MAY 2009	09FWAMW47-GW(S)	433.15	0.0004
	SEP 2009	09FWAMW47-GWF	432.98	0.00065
	JUL 2010	10FWAMW47-GWS	431.92	0.00043
	OCT 2010	10FWAMW47-GWF	432.11	0.0004
	OCT 2011	11FWAMW47-GWF	433.35	0.000087
	JUL 2012	12FWAMW47-GWS	436.32	0.0004
	SEP 2012	12FWAMW47-GWF	434.99	0.00019

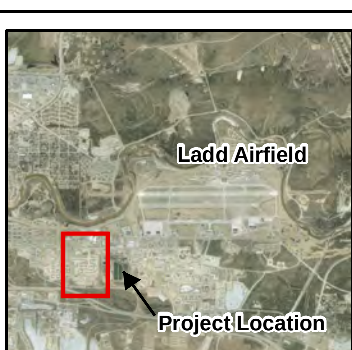
Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	TCP Result
MW79				
Screen	OCT 2008	08FWAMW79-GWF	442.79	0.0008
Interval	MAY 2009	09FWAMW79-GW(S)	442.40	0.0003
(Ft bgs)	SEP 2009	09FWAMW79-GWF	442.47	0.0012
11.5-21.5	JUL 2010	10FWAMW79-GWS	441.56	0.0003
	OCT 2010	10FWAMW79-GWF	441.25	0.0005
	JUL 2011	11FWAMW79-GWS	443.31	0.0003
	OCT 2011	11FWAMW79-GWF	441.56	0.0004
	JUL 2012	12FWAMW79-GWS	435.62	0.0002
	SEP 2012	12FWAMW79-GWF	435.33	0.0004

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	TCP Result
MW48				
Screen	OCT 2007	07FWAMW48-GW(F)	433.16	ND (0.00011)
Interval	MAY 2008	08FWAMW48-GW(S)	NM	0.000026
(Ft bgs)	OCT 2008	08FWAMW48-GWF	433.71	ND (0.000014)
7.5-17.5	MAY 2009	09FWAMW48-GW(S)	433.35	ND (0.000014)
	SEP 2009	09FWAMW48-GWF	433.18	ND (0.000014)
	JUL 2010	10FWAMW48-GWS	432.52	ND (0.0003)
	OCT 2010	10FWAMW48-GWF	432.20	ND (0.00045)
	JUL 2011	11FWAMW48-GWS	434.30	ND (0.0001)
	OCT 2011	11FWAMW48-GWF	433.47	ND (0.0001)
	JUL 2012	12FWAMW48-GWS	435.64	ND* (0.0002)
	SEP 2012	12FWAMW48-GWF	435.34	ND* (0.0005)

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	TCP Result
MW87				
Screen	JUL 2010	10FWAMW87-GWF	432.66	*ND (0.00045)
Interval	OCT 2010	10FWAMW87-GWS	432.05	*ND (0.0003)
(Ft bgs)	JUL 2011	11FWAMW87-GWS	434.23	ND (0.0001)
9.5-19.5	OCT 2011	11FWAMW87-GWF	433.59	ND (0.0001)
	JUL 2012	11FWAMW87-GWS	435.63	*ND (0.0002)
	SEP 2012	12FWAMW87-GWF	435.41	*ND (0.0005)

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	TCP Result
MW13				
Screen	OCT 2007	07FWDMW13-GW	433.57	ND (0.0003)
Interval	MAY 2008	08FWDMW13-GW	NM	0.00021
(Ft bgs)	OCT 2008	08FWDMW13-GWF	434.17	ND (0.000014)
7-17	MAY 2009	09FWDMW13-GW	433.42	ND (0.000014)
	SEP 2009	09FWDMW13-GWF	433.37	ND (0.000014)
	JUL 2010	10FWAMW13-GWS	432.6	ND* (0.0003)
	OCT 2010	10FWAMW13-GWF	432.25	ND* (0.00045)
	JUL 2011	11FWAMW13-GWS	433.94	ND* (0.00045)
	OCT 2011	11FWAMW13-GWF	433.46	ND* (0.00045)
	JUL 2012	12FWAMW13-GWS	436.26	ND* (0.0002)
	SEP 2012	12FWAMW13-GWF	435.91	ND* (0.0005)

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	TCP Result
MW08				
Screen	OCT 2007	07FWAMW08-GW(F)	432.90	*ND (0.0003)
Interval	MAY 2008	08FWAMW08-GW(S)	NM	0.000023
(Ft bgs)	OCT 2008	08FWAMW08-GWF	433.60	0.00026
9-19	MAY 2009	09FWAMW08-GW(S)	433.15	0.000024
	SEP 2009	09FWAMW08-GWF	433.05	0.000034
	JUL 2010	10FWAMW08-GWS	432.45	*ND (0.0003)
	OCT 2010	10FWAMW08-GWF	428.85	*ND (0.00045)
	JUL 2011	11FWAMW08-GWS	434.08	ND (0.0001)
	OCT 2011	11FWAMW08-GWF	433.40	0.000057
	JUL 2012	12FWAMW08-GWS	435.82	0.00013
	SEP 2012	12FWAMW08-GWF	435.52	*ND (0.0005)



2012 Sampled Well - TCP Exceedance

2012 Sampled Well - No TCP Exceedance

Onsite Well

Post Water Supply Well

Notes:
Project Cleanup Level: 0.00012
Units: mg/L
Method: SW8260, SW8260SIM

The F or S at the end of the sample ID indicates Spring or Fall sampling.

RED exceeded the project cleanup level.
TCP: 1,2,3-Trichloropropane
Results are presented without qualifiers.
ND = not detected
*ND = not detected but limit of quantitation exceeds project cleanup level.

All Locations Are Approximate

0 250 500 750 1,000
Feet

WGS 1984 UTM Zone 6N

N

OPERABLE UNIT 6
1,2,3-TRICHLOROPROPANE (TCP)
RESULTS FOR IN-PLUME AND SURROUNDING WELLS

FORT WAINWRIGHT, FAIRBANKS, ALASKA

JACOBS

DATE:	PROJECT MANAGER:	FIGURE NO:
08 APR 2015	S. RICHMOND	A-10

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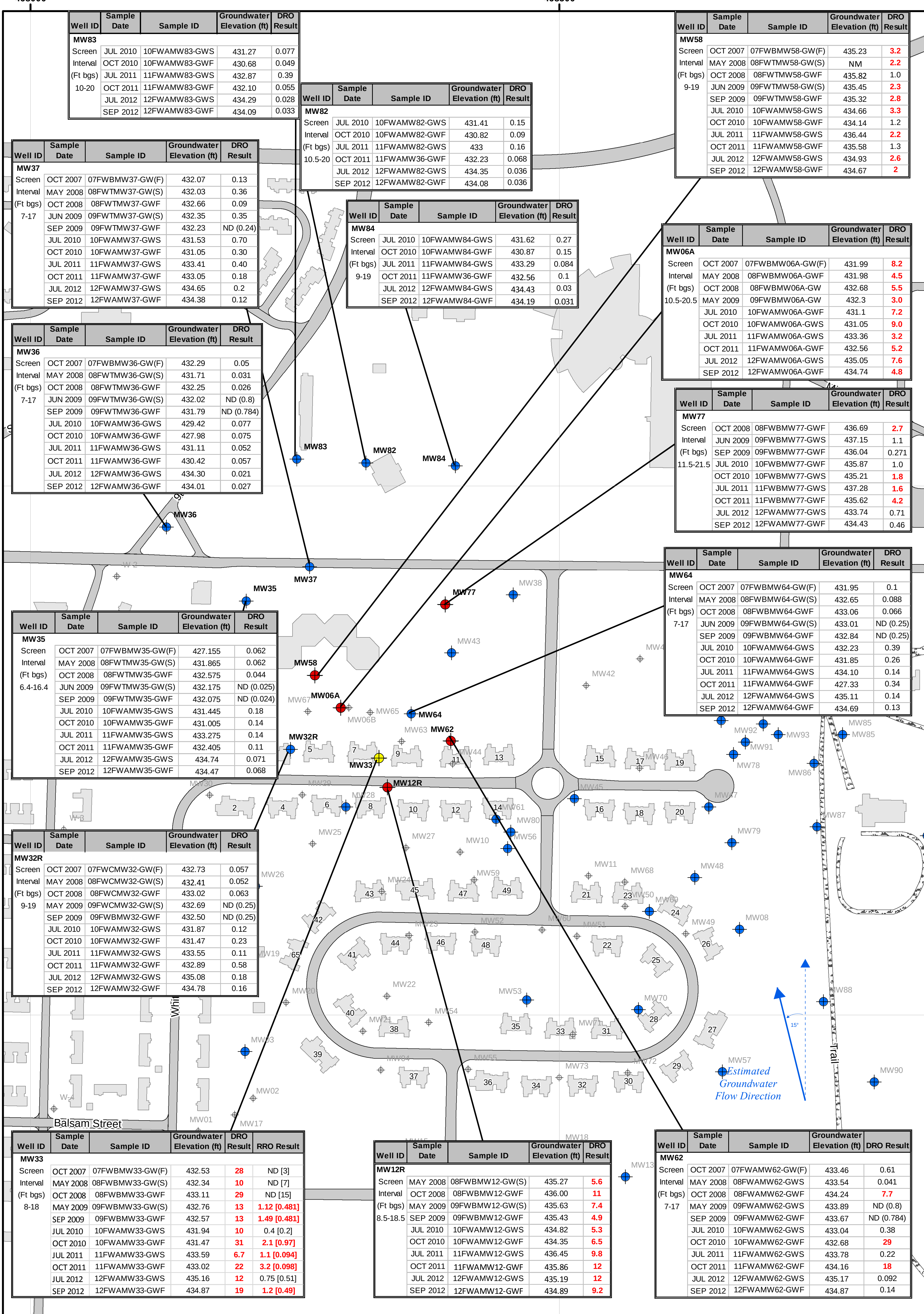

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	DRO Result
MW83				
Screen	JUL 2010	10FWAMW83-GWS	431.27	0.077
Interval	OCT 2010	10FWAMW83-GWF	430.68	0.049
(Ft bgs)	JUL 2011	11FWAMW83-GWS	432.87	0.39
10-20	OCT 2011	11FWAMW83-GWF	432.10	0.055
	JUL 2012	12FWAMW83-GWS	434.29	0.028
	SEP 2012	12FWAMW83-GWF	434.09	0.033

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	DRO Result
MW82				
Screen	JUL 2010	10FWAMW82-GWS	431.41	0.15
Interval	OCT 2010	10FWAMW82-GWF	430.82	0.09
(Ft bgs)	JUL 2011	11FWAMW82-GWS	433	0.16
10.5-20	OCT 2011	11FWAMW36-GWF	432.23	0.068
	JUL 2012	12FWAMW82-GWS	434.35	0.036
	SEP 2012	12FWAMW82-GWF	434.08	0.036

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	DRO Result
MW58				
Screen	OCT 2007	07FWBMW58-GW(F)	435.23	3.2
Interval	MAY 2008	08FWTMW58-GW(S)	NM	2.2
(Ft bgs)	OCT 2008	08FWTMW58-GWF	435.82	1.0
9-19	JUN 2009	09FWTMW58-GW(S)	435.45	2.3
	SEP 2009	09FWTMW58-GWF	435.32	2.8
	JUL 2010	10FWAMW58-GWS	434.66	3.3
	OCT 2010	10FWAMW58-GWF	434.14	1.2
	JUL 2011	11FWAMW58-GWS	436.44	2.2
	OCT 2011	11FWAMW58-GWF	435.58	1.3
	JUL 2012	12FWAMW58-GWS	434.93	2.6
	SEP 2012	12FWAMW58-GWF	434.67	2

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	DRO Result
MW37				
Screen	OCT 2007	07FWBMW37-GW(F)	432.07	0.13
Interval	MAY 2008	08FWTMW37-GW(S)	432.03	0.36
(Ft bgs)	OCT 2008	08FWTMW37-GWF	432.66	0.09
7-17	JUN 2009	09FWTMW37-GW(S)	432.35	0.35
	SEP 2009	09FWTMW37-GWS	432.23	ND (0.24)
	JUL 2010	10FWAMW37-GWS	431.53	0.70
	OCT 2010	10FWAMW37-GWF	431.05	0.30
	JUL 2011	11FWAMW37-GWS	433.41	0.40
	OCT 2011	11FWAMW37-GWF	433.05	0.18
	JUL 2012	12FWAMW37-GWS	434.65	0.2
	SEP 2012	12FWAMW37-GWF	434.38	0.12

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	DRO Result
MW84				
Screen	JUL 2010	10FWAMW84-GWS	431.62	0.27
Interval	OCT 2010	10FWAMW84-GWF	430.87	0.15
(Ft bgs)	JUL 2011	11FWAMW84-GWS	433.29	0.084
9-19	OCT 2011	11FWAMW36-GWF	432.56	0.1
	JUL 2012	12FWAMW84-GWS	434.43	0.03
	SEP 2012	12FWAMW84-GWF	434.19	0.031

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	DRO Result
MW06A				
Screen	OCT 2007	07FWBMW06A-GW(F)	431.99	8.2
Interval	MAY 2008	08FWBMW06A-GWF	431.98	4.5
(Ft bgs)	OCT 2008	08FWBMW06A-GW	432.68	5.5
10.5-20.5	MAY 2009	09FWBMW06A-GW	432.3	3.0
	JUL 2010	10FWAMW06A-GWF	431.1	7.2
	OCT 2010	10FWAMW06A-GWS	431.05	9.0
	JUL 2011	11FWAMW06A-GWS	433.36	3.2
	OCT 2011	11FWAMW06A-GWF	432.56	5.2
	JUL 2012	12FWAMW06A-GWS	435.05	7.6
	SEP 2012	12FWAMW06A-GWF	434.74	4.8

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	DRO Result
MW36				
Screen	OCT 2007	07FWBMW36-GW(F)	432.29	0.05
Interval	MAY 2008	08FWTMW36-GW(S)	431.71	0.031
(Ft bgs)	OCT 2008	08FWTMW36-GWF	432.25	0.026
7-17	JUN 2009	09FWTMW36-GW(S)	432.02	ND (0.8)
	SEP 2009	09FWTMW36-GWF	431.79	ND (0.784)
	JUL 2010	10FWAMW36-GWS	429.42	0.077
	OCT 2010	10FWAMW36-GWF	427.98	0.075
	JUL 2011	11FWAMW36-GWS	431.11	0.052
	OCT 2011	11FWAMW36-GWF	430.42	0.057
	JUL 2012	12FWAMW36-GWS	434.30	0.021
	SEP 2012	12FWAMW36-GWF	434.01	0.027

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	DRO Result
MW77				
Screen	OCT 2008	08FWBMW77-GWF	436.69	2.7
Interval	JUN 2009	09FWBMW77-GWS	437.15	1.1
(Ft bgs)	SEP 2009	09FWBMW77-GWF	436.04	0.271
11.5-21.5	JUL 2010	10FWBMW77-GWS	435.87	1.0
	OCT 2010	10FWBMW77-GWS	435.21	1.8
	JUL 2011	11FWBMW77-GWS	437.28	1.6
	OCT 2011	11FWBMW77-GWF	435.62	4.2
	JUL 2012	12FWAMW77-GWS	433.74	0.71
	SEP 2012	12FWAMW77-GWF	434.43	0.46

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	DRO Result
MW64				
Screen	OCT 2007	07FWBMW64-GW(F)	431.95	0.1
Interval	MAY 2008	08FWTMW64-GW(S)	432.65	0.088
(Ft bgs)	OCT 2008	08FWBMW64-GWF	433.06	0.066
7-17	JUN 2009	09FWBMW64-GW(S)	433.01	ND (0.25)
	SEP 2009	09FWBMW64-GWF	432.84	ND (0.25)
	JUL 2010	10FWAMW64-GWS	432.23	0.39
	OCT 2010	10FWAMW64-GWF	431.85	0.26
	JUL 2011	11FWAMW64-GWS	434.10	0.14
	OCT 2011	11FWAMW64-GWF	427.33	0.34
	JUL 2012	12FWAMW64-GWS	435.11	0.14
	SEP 2012	12FWAMW64-GWF	434.69	0.13

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	DRO Result
MW35				
Screen	OCT 2007	07FWBMW35-GW(F)	427.155	0.062
Interval	MAY 2008	08FWTMW35-GW(S)	431.865	0.062
(Ft bgs)	OCT 2008	08FWTMW35-GWF	432.575	0.044
6.4-16.4	JUN 2009	09FWTMW35-GW(S)	432.175	ND (0.025)
	SEP 2009	09FWTMW35-GWF	432.075	ND (0.024)
	JUL 2010	10FWAMW35-GWS	431.445	0.18
	OCT 2010	10FWAMW35-GWF	431.005	0.14
	JUL 2011	11FWAMW35-GWS	433.275	0.14
	OCT 2011	11FWAMW35-GWF	432.405	0.11
	JUL 2012	12FWAMW35-GWS	434.74	0.071
	SEP 2012	12FWAMW35-GWF	434.47	0.068

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	DRO Result
MW32R				
Screen	OCT 2007	07FWCMW32-GW(F)	432.73	0.057
Interval	MAY 2008	08FWCMW32-GW(S)	432.41	0.052
(Ft bgs)	OCT 2008	08FWCMW32-GWF	433.02	0.063
9-19	MAY 2009	09FWCMW32-GW(S)	432.69	ND (0.25)
	SEP 2009	09FWBMW32-GWF	432.50	ND (0.25)
	JUL 2010	10FWAMW32-GWS	431.87	0.12
	OCT 2010	10FWAMW32-GWF	431.47	0.23
	JUL 2011	11FWAMW32-GWS	433.55	0.11
	OCT 2011	11FWAMW32-GWF	432.89	0.58
	JUL 2012	12FWAMW32-GWS	435.08	0.18
	SEP 2012	12FWAMW32-GWF	434.78	0.16

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	DRO Result	RRO Result
MW33					
Screen	OCT 2007	07FWBMW33-GW(F)	432.53	28	ND [3]
Interval	MAY 2008	08FWBMW33-GW(S)	432.34	10	ND [7]
(Ft bgs)	OCT 2008	08FWBMW33-GWF	433.11	29	ND [15]
8-18	MAY 2009	09FWBMW33-GW(S)	432.76	13	1.12 [0.481]
	SEP 2009	09FWBMW33-GWF	432.57	13	1.49 [0.481]
	JUL 2010	10FWAMW33-GWS	431.94	10	0.4 [0.2]
	OCT 2010	10FWAMW33-GWF	431.47	31	2.1 [0.97]
	JUL 2011	11FWAMW33-GWS	433.59	6.7	1.1 [0.094]
	OCT 2011	11FWAMW33-GWF	433.02	22	3.2 [0.098]
	JUL 2012	12FWAMW33-GWS	435.16	12	0.75 [0.51]
	SEP 2012	12FWAMW33-GWF	434.87	19	1.2 [0.49]

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	DRO Result
MW12R				
Screen	MAY 2008	08FWBMW12-GW(S)	435.27	5.6
Interval	OCT 2008	08FWBMW12-GWF	436.00	11
(Ft bgs)	MAY 2009	09FWBMW12-GW(S)	435.63	7.4
8.5-18.5	SEP 2009	09FWBMW12-GWF	435.43	4.9
	JUL 2010	10FWAMW12-GWS	434.82	5.3
	OCT 2010	10FWAMW12-GWF	434.35	6.5
	JUL 2011	11FWAMW12-GWS	436.45	9.8
	OCT 2011	11FWAMW12-GWF	435.86	12
	JUL 2012	12FWAMW12-GWS	435.19	12
	SEP 2012	12FWAMW12-GWF	434.89	9.2

Well ID	Sample Date	Sample ID	Groundwater Elevation (ft)	DRO Result
MW62				
Screen	OCT 2007	07FWAMW62-GW(F)	433.46	0.61
Interval	MAY 2008	08FWAMW62-GWS	433.54	0.041
(Ft bgs)	OCT 2008	08FWAMW62-GWF	434.24	7.7
7-17	MAY 2009	09FWAMW62-GWS	433.89	ND (0.8)
	SEP 2009	09FWAMW62-GWF	433.67	ND (0.784)
	JUL 2010	10FWAMW62-GWS	433.04	0.38
	OCT 2010	10FWAMW62-GWF	432.68	29
	JUL 2011	11FWAMW62-GWS	433.78	0.22
	OCT 2011	11FWAMW62-GWF	434.16	18
	JUL 2012	12FWAMW62-GWS	435.17	0.092
	SEP 2012	12FWAMW62-GWF	434.87	0.14

2012 Sampled Well - DRO & RRO Exceedance

2012 Sampled Well - DRO Exceedance

2012 Sampled Well - No DRO or RRO Exceedance

Onsite Well

Post Water Supply Well

Notes:
Project Cleanup Level: 1.5
Units: mg/L
Method: AK102

The F or S at the end of the sample ID indicates Spring or Fall sampling.

RED exceeded the Project Cleanup Level.
DRO: Diesel Range Organics (C10-C25)
Results presented without qualifiers.
ND = not detected

All Locations Are Approximate

0 250 500 750 1,000
Feet

WGS 1984 UTM Zone 6N

N

OPERABLE UNIT 6
DIESEL RANGE ORGANICS (DRO) & RESIDUAL RANGE ORGANICS (RRO)
RESULTS FOR IN-PLUME AND SURROUNDING WELLS
FORT WAINWRIGHT, FAIRBANKS, ALASKA

JACOBS

DATE:	PROJECT MANAGER:	FIGURE NO:
08 APR 2015	S. RICHMOND	A-11

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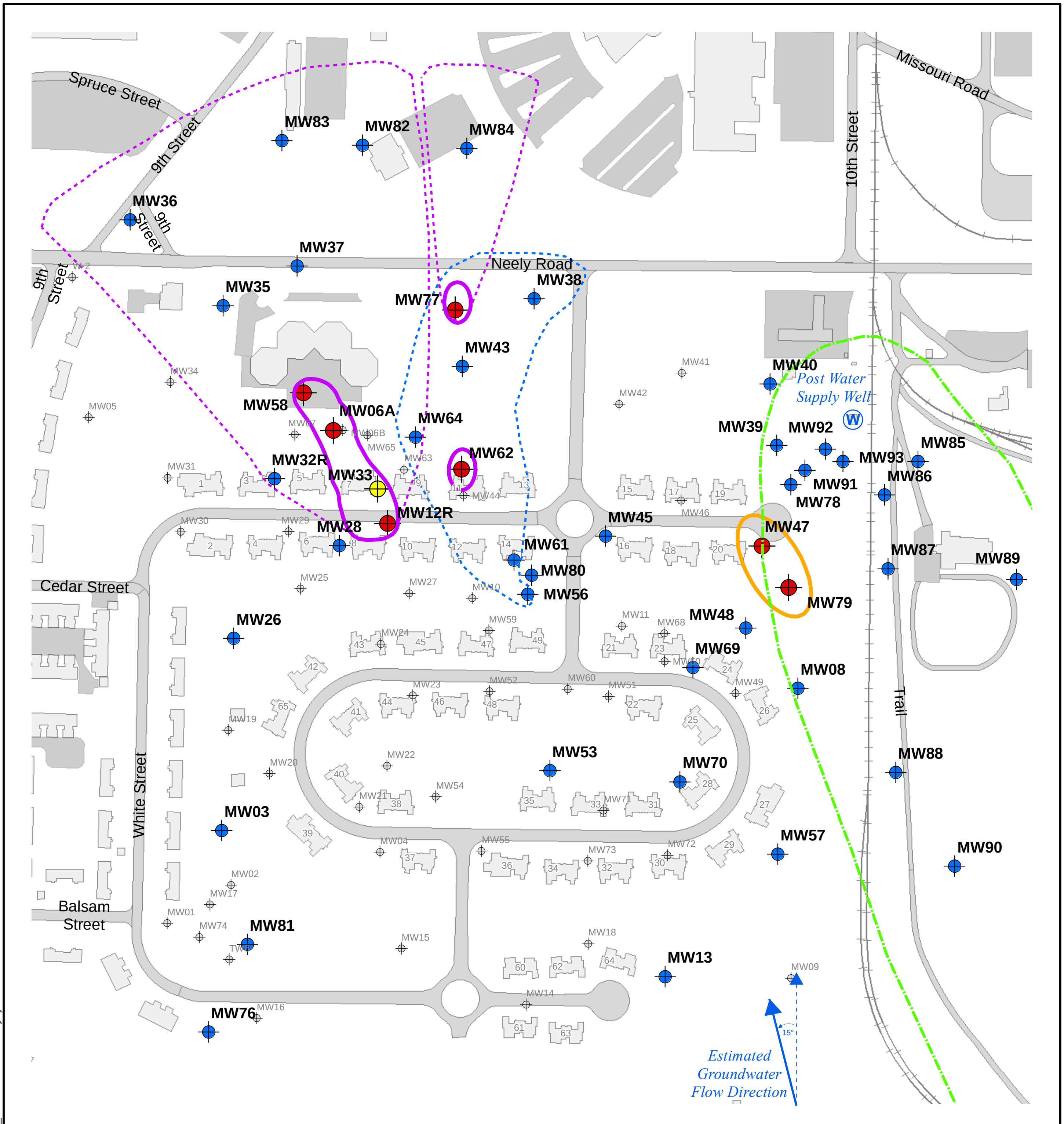

PostWaterSupplyWell_CaptureZone

DRO Above ADEC Criteria (Plume Area)

TCP Above ADEC Criteria (Plume Area)

DRO Below ADEC Criteria (Leading Plume Edge)

TCE Below ADEC Criteria (Leading Plume Edge)

TCP Below ADEC Criteria (Leading Plume Edge)

2011 & 2012 Sampled Well - DRO & RRO Exceedance

2011 & 2012 Sampled Well - Exceedance

2011 & 2012 Sampled Well - No Exceedance

Onsite Well

Post Water Supply Well

Building

Railroad

Road or Trail

TCP: 1,2,3-Trichloropropane
*Modeled by CH2M Hill (USACE 2010 Appendix B), for a pumping rate of 1,700 gpm.

All Locations Are Approximate

0 250 500 750 1,000

Feet

WGS 1984 UTM Zone 6N

N

OPERABLE UNIT 6
2011 & 2012 GROUNDWATER MONITORING EXCEEDANCES AND PLUME BOUNDARIES

FORT WAINWRIGHT, FAIRBANKS, ALASKA

JACOBS	DATE: 26 MAR 2015	PROJECT MANAGER: S. RICHMOND	FIGURE NO: A-12

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Image Source: Fort Wainwright DPW - ENV, 2012

Fence

OU6 Institutional Control Boundary

Buildings 50-59 Not Built

Building

Paved Road

Unpaved Road

All Locations Are Approximate

0 100 200 300 400

Feet

Alaska State Plane Zone 3
Transverse Mercator

N

OPERABLE UNIT 6
SOIL AND GROUNDWATER
INSTITUTIONAL CONTROL BOUNDARY

FORT WAINWRIGHT, FAIRBANKS, ALASKA

JACOBS	DATE: 23 JUN 2014	PROJECT MANAGER: S. RICHMOND	FIGURE NO: A-15

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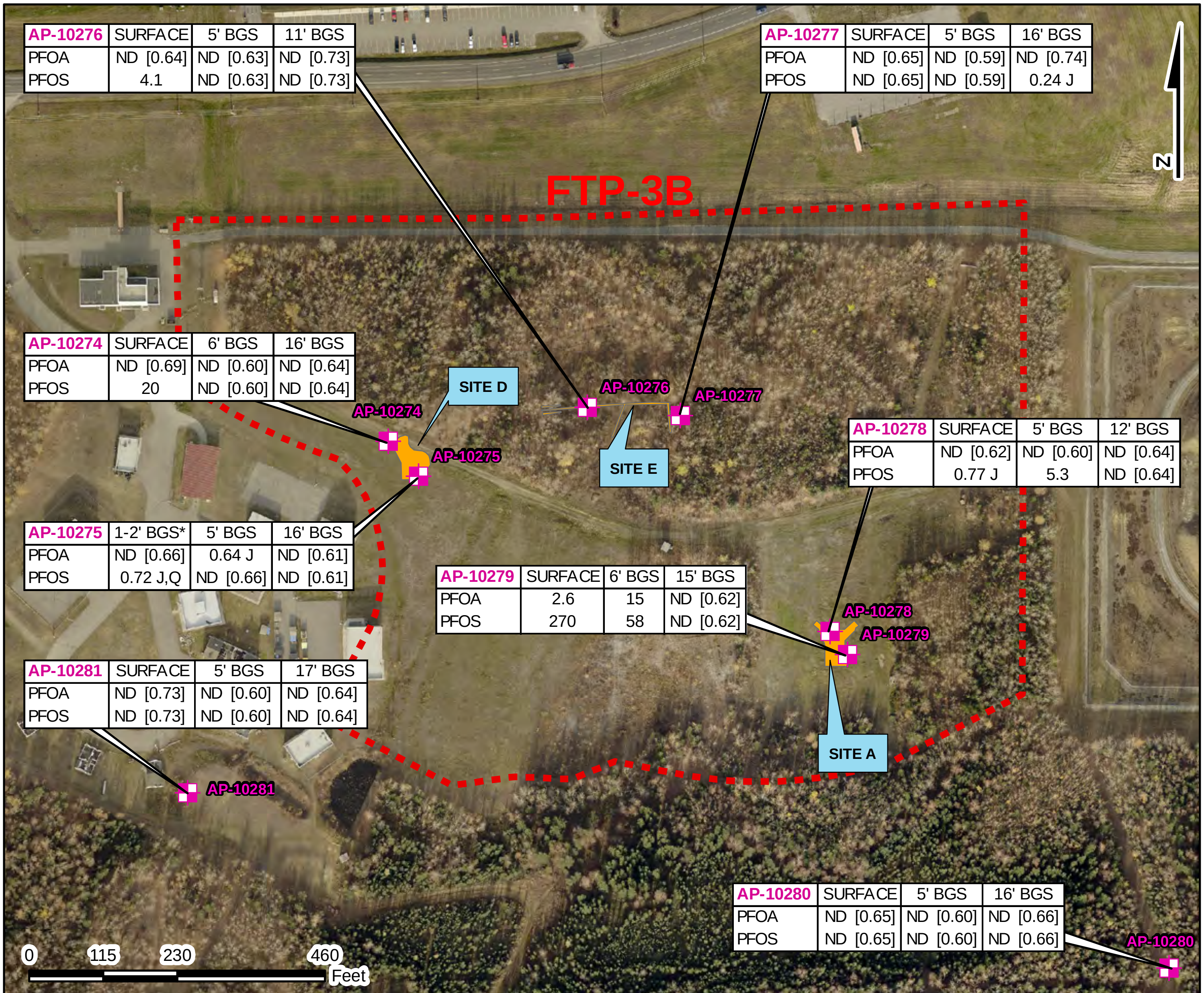


AP-10276	SURFACE	5' BGS	11' BGS
PFOA	ND [0.64]	ND [0.63]	ND [0.73]
PFOS	4.1	ND [0.63]	ND [0.73]

AP-10277	SURFACE	5' BGS	16' BGS
PFOA	ND [0.65]	ND [0.59]	ND [0.74]
PFOS	ND [0.65]	ND [0.59]	0.24 J

AP-10274	SURFACE	6' BGS	16' BGS
PFOA	ND [0.69]	ND [0.60]	ND [0.64]
PFOS	20	ND [0.60]	ND [0.64]

AP-10278	SURFACE	5' BGS	12' BGS
PFOA	ND [0.62]	ND [0.60]	ND [0.64]
PFOS	0.77 J	5.3	ND [0.64]

AP-10275	1-2' BGS*	5' BGS	16' BGS
PFOA	ND [0.66]	0.64 J	ND [0.61]
PFOS	0.72 J,Q	ND [0.66]	ND [0.61]

AP-10279	SURFACE	6' BGS	15' BGS
PFOA	2.6	15	ND [0.62]
PFOS	270	58	ND [0.62]

AP-10281	SURFACE	5' BGS	17' BGS
PFOA	ND [0.73]	ND [0.60]	ND [0.64]
PFOS	ND [0.73]	ND [0.60]	ND [0.64]

AP-10280	SURFACE	5' BGS	16' BGS
PFOA	ND [0.65]	ND [0.60]	ND [0.66]
PFOS	ND [0.65]	ND [0.60]	ND [0.66]

ADEC SCREENING LEVELS:

	Human Health µg/kg	Migration to Groundwater µg/kg
PFOA	2,030	142
PFOS	3,040	571

EPA REGION 4 RESIDENTIAL SOIL SCREENING LEVELS IN µg/kg

PFOA	16,000
PFOS	6,000

LEGEND:

AP-10279 Borehole (2013)

Excavated Area

Former FTP Area

PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
BGS	Below Ground Surface
FTP	Fire Training Pit
µg/kg	Micrograms per Kilogram
ND	Not Detected [LOD Presented in Brackets]
LOD	Limit of Detection
LOQ	Limit of Quantitation
J	Result Qualified as Estimate because it is less than the LOQ
Q	Result Considered an Estimate due to Matrix Interference

NOTES:

1. The proposed ADEC cleanup levels are from the Public Comment Draft of the revision to 18 AAC 75, Oil and Other Hazardous Substances Pollution Control (ADEC, 2015)

2. EPA Region 4 Residential Soil Screening Levels from "Soil Screening Levels for Perfluorooctanaoic Acid (PFOA) and Perfluorooctyl Sulfonate (PFOS)." (EPA, 2009b)

3. * Denotes the top foot of the sample core was fill gravel so a sample was collected from 1-2 BGS

4. Coordinate System - Projection: World Geodetic System of 1984 (WGS84) Universal Transverse Mercator (UTM), Zone 6N, Meters

5. Aerial imagery obtained from USAG Fort Wainwright DPW Environmental, 2014

KEY:

Boring Location

Depth in feet BGS

AP-10279	SURFACE	6' BGS	15' BGS
PFOA	2.6	15	ND [0.62]
PFOS	270	58	ND [0.62]

Results shown in µg/kg

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

PFOS and PFOA Concentrations in FTP-3B Soil Samples
Fire Training Pits Investigation
Fort Wainwright, Alaska

Contract: W911KB-12-D-0001 | Figure: 4-2 | Date: 1/16

Table A-4 Subsurface Soil Sample Results
Fire Training Pits Investigation
Fort Wainwright, Alaska

Sample ID			ADEC Cleanup Level/[1,2] EPA Screening Level[3]	13FWFP01SO	13FWFP02SO	13FWFP03SO	13FWFP04SO	13FWFP05SO	13FWFP06SO	13FWFP07SO	13FWFP08SO	13FWFP09SO	13FWFP10SO	13FWFP11SO	13FWFP12SO	13FWFP13SO	13FWFP14SO	13FWFP15SO	13FWFP16SO	13FWFP17SO	13FWFP18SO	13FWFP19SO
Boring ID				AP-10261	AP-10261	AP-10262	AP-10262	AP-10263	AP-10263	AP-10263	AP-10264	AP-10264	AP-10265	AP-10265	AP-10266	AP-10266	AP-10267	AP-10267	AP-10267	AP-10268	AP-10268	AP-10269
Location ID				BH0106	BH0115	BH0206	BH0215	BH0306	BH0317	BH03	BH0406	BH0416	BH0506	BH0515	BH0606	BH0616	BH0706	BH0716	BH07	BH0806	BH0816	BH0906
Laboratory				TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC
Lab Sample ID				48825-2	48825-3	48825-5	48825-6	48825-8	48825-9	48825-10	48825-12	48825-13	48840-2	48840-3	48825-16	48825-17	48840-5	48840-6	48840-7	48840-9	48840-10	48840-12
Collect Date				10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013
Matrix				SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO
Sample Type				Primary	Primary	Primary	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary
Analyte	**Method**	**Units**		**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**
Gasoline Range Organics (C6-C10)	AK101	mg/kg	300	4.20 [0.39] B	0.54 [0.56] J,B	1.40 [0.48] B	0.65 [0.44] B,QL	1.40 [0.47] B	0.9 [0.55] B,QL,Q	0.68[0.55]J,B,QL,Q	1.40 [0.41] B	ND [0.71] QL	1.60 [0.41] B	0.39[0.79] J,B,QL	0.32[0.37] J,B	0.31[0.63] J,B,QL	1.70[0.50] J,B,ML	1.40[0.47] B,Q	0.51[0.45] J,B,Q	0.66[0.50] J,B	0.28[0.48] J,B,QL	0.34[0.46] J,B
Diesel Range Organics (C10-C25)	AK102	mg/kg	250	1.6 [2.0] J	3.8 [2.2] J	1.5 [2.2] J	1.5 [2.0] J	1.8 [2.2] J	2.7 [2.3] J	1.3 [2.3] J	1.7 [2.0] J	2.7 [2.6] J	1.6 [2.0] J	1.4 [2.5] J	ND [2.0]	ND [2.4]	1.2 [2.1] J	1.3 [2.2] J	1.4 [2.2] J	2.1 [2.2] J	1.7 [2.1] J	1.0 [2.1] J
Residual Range Organics (C25-C36)	AK103	mg/kg	11000	ND [9.8]	ND [11]	ND [11]	ND [10]	ND [11]	ND [12]	ND [12]	ND [9.8]	ND [13] QL	ND [10]	ND [13]	ND [9.9]	ND [12]	ND [11]	ND [11]	ND [11]	ND [11]	ND [11]	ND [11]
Arsenic	SW6020A	µg/kg	3900	2500 [140]	2800 [160]	**7100 [160]**	**5300 [140]**	**8800 [140]**	1800 [180]	1500 [150]	**5000 [140]**	2900 [190]	**7200 [160]**	2600 [170]	**4500 [140]**	**4700 [170]**	**7100 [160]**	2400 [160]	2500 [150]	**10000 [160]**	2600 [160]	**7400 [160]**
Barium	SW6020A	µg/kg	1100000	46000 [190]	75000 [210]	77000 [220]	70000 [180]	98000 [190]	71000 [230]	64000 [200]	60000 [190]	78000 [250]	81000 [210]	58000 [220]	60000 [190]	62000 [220]	87000 [210]	51000 [210]	37000 [200]	100000 [220]	47000 [220]	85000 [220]
Cadmium	SW6020A	µg/kg	5000	38 [24] J	56 [27] J	110 [27]	22 [23] J	150 [24]	35 [29] J	39 [25] J	79 [24] J	67 [31] J	150 [26]	110 [28]	76 [23] J	37 [28] J	170 [26]	100 [27] J	73 [25] J	210 [27]	95 [27] J	180 [27]
Chromium	SW6020A	µg/kg	25000	9000 [160]	7700 [190]	14000 [190]	6300 [160]	17000 [170]	7100 [210]	8800 [180]	12000 [170]	13000 [220]	15000 [180]	11000 [190]	12000 [160]	11000 [190]	15000 [180]	7400 [190]	8500 [170]	18000 [190]	9900 [190]	14000 [190]
Lead	SW6020A	µg/kg	400000	3300 [47]	2800 [54]	4900 [54]	3300 [45]	5700 [48]	2200 [59]	2200 [50]	3800 [48]	4000 [63]	4800 [52]	3300 [55]	3900 [47]	2900 [56]	4800 [52]	3000 [53]	2400 [49]	6600 [54]	2900 [55]	5000 [55]
Selenium	SW6020A	µg/kg	3400	ND [240]	ND [270]	170 [270] J	ND [230]	250 [240] J	ND [290]	ND [250]	ND [240]	ND [310]	1200 [260]	900 [280]	ND [230]	ND [280]	1200 [260]	580 [270]	630 [250]	1600 [270]	770 [270]	1300 [270]
Silver	SW6020A	µg/kg	11200	30 [56] J	22 [64] J	38 [65] J	58 [54] J	56 [58] J	ND [70]	ND [60]	43 [57] J	41 [75] J	51 [62] J	27 [66] J	27 [56] J	ND [67]	41 [62] J	69 [64] J,Q	25 [59] J,Q	72 [65] J	28 [66] J	70 [66] J
Mercury	SW7471B	µg/kg	1400	ND [15]	250 [18]	ND [16]	ND [15]	10 [16] J	ND [18]	ND [17]	ND [14]	14 [20] J	13 [15] J	ND [18]	ND [14]	ND [19]	11 [15] J	6.8 [16] J,Q	67 [16] Q	19 [15]	9.1 [17] J	29 [16]
1,1,1,2-Tetrachloroethane	SW8260B	µg/kg	NE	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
1,1,1-Trichloroethane	SW8260B	µg/kg	820	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13] ML	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
1,1,2,2-Tetrachloroethane	SW8260B	µg/kg	17	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
1,1,2-Trichloroethane	SW8260B	µg/kg	18	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
1,1-Dichloroethane	SW8260B	µg/kg	25000	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13] ML	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
1,1-Dichloroethene	SW8260B	µg/kg	30	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13] ML	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
1,1-Dichloropropene	SW8260B	µg/kg	NE	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13] ML	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
1,2,3-Trichlorobenzene	SW8260B	µg/kg	NE	ND [14]	ND [21]	ND [18]	ND [16]	ND [18]	ND [20]	ND [20]	ND [15]	ND [26]	ND [15]	ND [30]	ND [0.044]	ND [23]	ND [19]	ND [17]	ND [17]	ND [19]	ND [18]	ND [17]
1,2,3-Trichloropropane	SW8260B	µg/kg	0.53	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
1,2,4-Trichlorobenzene	SW8260B	µg/kg	850	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
1,2,4-Trimethylbenzene	SW8260B	µg/kg	23000	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
1,2-Dibromo-3-chloropropane	SW8260B	µg/kg	NE	ND [48]	ND [70]	ND [59]	ND [55]	ND [59]	ND [68]	ND [68]	ND [51]	ND [88]	ND [50]	ND [100]	ND [0.15]	ND [78]	ND [63]	ND [58]	ND [55]	ND [63]	ND [59]	ND [57]
1,2-Dibromoethane	SW8260B	µg/kg	0.16	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
1,2-Dichlorobenzene	SW8260B	µg/kg	5100	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
1,2-Dichloroethane	SW8260B	µg/kg	16	ND [7.7]	ND [11]	ND [9.5]	ND [8.7]	ND [9.4]	ND [11]	ND [11]	ND [8.1]	ND [14]	ND [8.0]	ND [16]	ND [0.024]	ND [13]	ND [10] ML	ND [9.3]	ND [8.8]	ND [10]	ND [9.4]	ND [9.2]
1,2-Dichloroethene, Total	SW8260B	µg/kg	NE	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
1,2-Dichloropropane	SW8260B	µg/kg	18	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13] ML	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
1,3,5-Trimethylbenzene	SW8260B	µg/kg	23000	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
1,3-Dichlorobenzene	SW8260B	µg/kg	28000	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
1,3-Dichloropropane	SW8260B	µg/kg	33	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
1,4-Dichlorobenzene	SW8260B	µg/kg	640	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
2,2-Dichloropropane	SW8260B	µg/kg	NE	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13] ML	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
2-Butanone	SW8260B	µg/kg	59000	ND [39]	ND [56]	ND [48]	ND [44]	ND [47]	ND [55]	ND [54]	ND [41]	ND [70]	ND [40]	ND [80]	ND [0.12]	ND [63]	ND [50]	ND [46]	ND [44]	ND [50]	ND [47]	ND [46]
2-Chlorotoluene	SW8260B	µg/kg	NE	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
2-Hexanone	SW8260B	µg/kg	NE	ND [39]	ND [56]	ND [48]	ND [44]	ND [47]	ND [55]	ND [54]	ND [41]	ND [70]	ND [40]	ND [80]	ND [0.12]	ND [63]	ND [50] R	ND [46]	ND [44]	ND [50]	ND [47]	ND [46]
4-Chlorotoluene	SW8260B	µg/kg	NE	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
4-Isopropyltoluene	SW8260B	µg/kg	NE	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
4-Methyl-2-pentanone	SW8260B	µg/kg	8100	ND [39]	ND [56]	ND [48]	ND [44]	ND [47]	ND [55]	ND [54]	ND [41]	ND [70]	ND [40]	ND [80]	ND [0.12]	ND [63]	ND [50] R	ND [46]	ND [44]	ND [50]	ND [47]	ND [46]
Acetone	SW8260B	µg/kg	88000	ND [96]	ND [140]	ND [120]	ND [110]	ND [120]	ND [140]	ND [140]	ND [100]	ND [180]	ND [100]	ND [200]	ND [0.30]	ND [160]	ND [130]	ND [120]	ND [110]	ND [130]	ND [120]	ND [110]
Benzene	SW8260B	µg/kg	25	ND [3.9]	ND [5.6]	ND [4.8]	ND [4.4]	ND [4.7]	ND [5.5]	ND [5.4]	ND [4.1]	ND [7.0]	ND [4.0]	ND [8.0]	ND [0.012]	ND [6.3]	ND [5.0] R	ND [4.6]	ND [4.4]	ND [5.0]	ND [4.7]	ND [4.6]
Bromobenzene	SW8260B	µg/kg	NE	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
Bromochloromethane	SW8260B	µg/kg	NE	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13] ML	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
Bromodichloromethane	SW8260B	µg/kg	44	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
Bromoform	SW8260B	µg/kg	340	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
Bromomethane	SW8260B	µg/kg	160	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13] R	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
Carbon disulfide	SW8260B	µg/kg	12000	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13] R	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
Carbon tetrachloride	SW8260B	µg/kg	23	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13] ML	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
Chlorobenzene	SW8260B	µg/kg	630	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13] ML	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
Chloroethane	SW8260B	µg/kg	580000	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13] ML	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
Chloroform	SW8260B	µg/kg	460	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13] ML	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
Chloromethane	SW8260B	µg/kg	210	ND [12]	ND [17]	ND [15]	ND [14]	ND [15]	ND [17]	ND [17]	ND [13]	ND [22]	ND [13]	ND [25]	ND [0.037]	ND [20]	ND [16] R	ND [14]	ND [14]	ND [16]	ND [15]	ND [14]
Dibromochloromethane	SW8260B	µg/kg	32	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
Dibromomethane	SW8260B	µg/kg	1100	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13] ML	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
Dichlorodifluoromethane	SW8260B	µg/kg	140000	ND [19]	ND [28]	ND [24]	ND [22]	ND [23]	ND [27]	ND [27]	ND [20]	ND [35]	ND [20]	ND [40]	ND [0.059]	ND [31]	ND [25] R	ND [23]	ND [22]	ND [25]	ND [23]	ND [23]
Ethylbenzene	SW8260B	µg/kg	6900	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13] ML	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
Hexachlorobutadiene	SW8260B	µg/kg	120	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
Isopropylbenzene	SW8260B	µg/kg	51000	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
Methyl-tert-butyl ether (MTBE)	SW8260B	µg/kg	1300	ND [48]	ND [70]	ND [59]	ND [55]	ND [59]	ND [68]	ND [68]	ND [51]	ND [88]	ND [50]	ND [100]	ND [0.15]	ND [78]	ND [63]	ND [58]	ND [55]	ND [63]	ND [59]	ND [57]
Methylene chloride	SW8260B	µg/kg	16	ND [19]	ND [28]	ND [24]	ND [22]	ND [23]	ND [27]	ND [27]	ND [20]	ND [35]	ND [20]	ND [40]	ND [0.059]	ND [31]	ND [25] ML	ND [23]	ND [22]	ND [25]	ND [23]	ND [23]
Naphthalene	SW8260B	µg/kg	20000	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
Styrene	SW8260B	µg/kg	960	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
Tetrachloroethene (PCE)	SW8260B	µg/kg	24	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13] ML	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
Toluene	SW8260B	µg/kg	6500	22 [9.6]	ND [14]	11 [12] J	11 [11] J	16 [12] J	11 [14] J	11 [14] J	7.1 [10] J	ND [18]	8.3 [10] J	9.0 [20] J	ND [0.030]	ND [16]	9.7 [13] ML	9.8 [12] J	ND [11]	ND [13]	5.2 [12] J	6.3 [11] J
Trichloroethene (TCE)	SW8260B	µg/kg	20	2.5 [9.6] J	4.9 [14] J	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13] ML	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
Trichlorofluoromethane	SW8260B	µg/kg	86000	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13] ML	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
Vinyl chloride	SW8260B	µg/kg	8.5	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13] R	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]

Table A-4 Subsurface Soil Sample Results
Fire Training Pits Investigation
Fort Wainwright, Alaska

		Sample ID	ADEC Cleanup Level/[1,2] EPA Screening Level[3]	13FWFP01SO	13FWFP02SO	13FWFP03SO	13FWFP04SO	13FWFP05SO	13FWFP06SO	13FWFP07SO	13FWFP08SO	13FWFP09SO	13FWFP10SO	13FWFP11SO	13FWFP12SO	13FWFP13SO	13FWFP14SO	13FWFP15SO	13FWFP16SO	13FWFP17SO	13FWFP18SO	13FWFP19SO
		Boring ID		AP-10261	AP-10261	AP-10262	AP-10262	AP-10263	AP-10263	AP-10263	AP-10264	AP-10264	AP-10265	AP-10265	AP-10266	AP-10266	AP-10267	AP-10267	AP-10267	AP-10268	AP-10268	AP-10269
		Location ID		BH0106	BH0115	BH0206	BH0215	BH0306	BH0317	BH03	BH0406	BH0416	BH0506	BH0515	BH0606	BH0616	BH0706	BH0716	BH07	BH0806	BH0816	BH0906
		Laboratory		TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC
		Lab Sample ID		48825-2	48825-3	48825-5	48825-6	48825-8	48825-9	48825-10	48825-12	48825-13	48840-2	48840-3	48825-16	48825-17	48840-5	48840-6	48840-7	48840-9	48840-10	48840-12
		Collect Date		10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013
		Matrix		SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO
		Sample Type		Primary	Primary	Primary	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary
Analyte	**Method**	**Units**		**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**
Xylene, Isomers m & p	SW8260B	µg/kg	63000	9.1 [19] J	ND [28]	ND [24]	ND [22]	ND [23]	ND [27]	ND [27]	ND [20]	ND [35]	ND [20]	ND [40]	ND [0.059]	ND [31]	ND [25] ML	ND [23]	ND [22]	ND [25]	ND [23]	ND [23]
cis-1,2-Dichloroethene	SW8260B	µg/kg	240	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13] ML	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
cis-1,3-Dichloropropene	SW8260B	µg/kg	33	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13] ML	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
n-Butylbenzene	SW8260B	µg/kg	15000	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
n-Propylbenzene	SW8260B	µg/kg	15000	ND [14]	ND [21]	ND [18]	ND [16]	ND [18]	ND [20]	ND [20]	ND [15]	ND [26]	ND [15]	ND [30]	ND [0.044]	ND [23]	ND [19]	ND [17]	ND [17]	ND [19]	ND [18]	ND [17]
o-Xylene	SW8260B	µg/kg	63000	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
sec-Butylbenzene	SW8260B	µg/kg	12000	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
tert-Butylbenzene	SW8260B	µg/kg	12000	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
trans-1,2-Dichloroethene	SW8260B	µg/kg	370	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13] ML	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
trans-1,3-Dichloropropene	SW8260B	µg/kg	33	ND [9.6]	ND [14]	ND [12]	ND [11]	ND [12]	ND [14]	ND [14]	ND [10]	ND [18]	ND [10]	ND [20]	ND [0.030]	ND [16]	ND [13]	ND [12]	ND [11]	ND [13]	ND [12]	ND [11]
1,2,4-Trichlorobenzene	SW8270D	µg/kg	850	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
1,2-Dichlorobenzene	SW8270D	µg/kg	5100	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
1,2-Diphenylhydrazine	SW8270D	µg/kg	28000	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
1,3-Dichlorobenzene	SW8270D	µg/kg	22000	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
1,4-Dichlorobenzene	SW8270D	µg/kg	6200	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
2,4,5-Trichlorophenol	SW8270D	µg/kg	67000	ND [130]	ND [150]	ND [140]	ND [130]	ND [140]	ND [150]	ND [140]	ND [130]	ND [160]	ND [130]	ND [160]	ND [130]	ND [160]	ND [130]	ND [140]	ND [140]	ND [140]	ND [130]	ND [140]
2,4,6-Trichlorophenol	SW8270D	µg/kg	1400	ND [67]	ND [77]	ND [72]	ND [69]	ND [73]	ND [76]	ND [71]	ND [66]	ND [84]	ND [64]	ND [81]	ND [65]	ND [82]	ND [67]	ND [73]	ND [71]	ND [69]	ND [67]	ND [71]
2,4-Dichlorophenol	SW8270D	µg/kg	1300	ND [67]	ND [77]	ND [72]	ND [69]	ND [73]	ND [76]	ND [71]	ND [66]	ND [84]	ND [64]	ND [81]	ND [65]	ND [82]	ND [67]	ND [73]	ND [71]	ND [69]	ND [67]	ND [71]
2,4-Dimethylphenol	SW8270D	µg/kg	8800	ND [130]	ND [150]	ND [140]	ND [130]	ND [140]	ND [150]	ND [140]	ND [130]	ND [160]	ND [130]	ND [160]	ND [130]	ND [160]	ND [130]	ND [140]	ND [140]	ND [140]	ND [130]	ND [140]
2,4-Dinitrophenol	SW8270D	µg/kg	540	ND [680]	ND [780]	ND [730]	ND [700]	ND [740]	ND [770]	ND [720]	ND [670]	ND [850]	ND [650]	ND [820]	ND [660]	ND [830]	ND [680]	ND [750]	ND [720]	ND [700]	ND [680]	ND [730]
2,4-Dinitrotoluene	SW8270D	µg/kg	9.3	ND [130]	ND [150]	ND [140]	ND [130]	ND [140]	ND [150]	ND [140]	ND [130]	ND [160]	ND [130]	ND [160]	ND [130]	ND [160]	ND [130]	ND [140]	ND [140]	ND [140]	ND [130]	ND [140]
2,6-Dichlorophenol	SW8270D	µg/kg	NE	ND [130]	ND [150]	ND [140]	ND [130]	ND [140]	ND [150]	ND [140]	ND [130]	ND [160]	ND [130]	ND [160]	ND [130]	ND [160]	ND [130]	ND [140]	ND [140]	ND [140]	ND [130]	ND [140]
2,6-Dinitrotoluene	SW8270D	µg/kg	9.4	ND [67]	ND [77]	ND [72]	ND [69]	ND [73]	ND [76]	ND [71]	ND [66]	ND [84]	ND [64]	ND [81]	ND [65]	ND [82]	ND [67]	ND [73]	ND [71]	ND [69]	ND [67]	ND [71]
2-Chloronaphthalene	SW8270D	µg/kg	120000	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
2-Chlorophenol	SW8270D	µg/kg	1500	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
2-Methyl-4,6-dinitrophenol	SW8270D	µg/kg	NE	ND [670]	ND [770]	ND [720]	ND [690]	ND [730]	ND [760]	ND [710]	ND [660]	ND [840]	ND [640]	ND [810]	ND [650]	ND [820]	ND [670]	ND [730]	ND [710]	ND [690]	ND [670]	ND [710]
2-Methylnaphthalene	SW8270D	µg/kg	6100	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
2-Methylphenol (o-Cresol)	SW8270D	µg/kg	15000	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
2-Nitroaniline	SW8270D	µg/kg	NE	ND [67]	ND [77]	ND [72]	ND [69]	ND [73]	ND [76]	ND [71]	ND [66]	ND [84]	ND [64]	ND [81]	ND [65]	ND [82]	ND [67]	ND [73]	ND [71]	ND [69]	ND [67]	ND [71]
2-Nitrophenol	SW8270D	µg/kg	NE	ND [67]	ND [77]	ND [72]	ND [69]	ND [73]	ND [76]	ND [71]	ND [66]	ND [84]	ND [64]	ND [81]	ND [65]	ND [82]	ND [67]	ND [73]	ND [71]	ND [69]	ND [67]	ND [71]
3,3'-Dichlorobenzidine	SW8270D	µg/kg	190	ND [340]	ND [390]	ND [360]	ND [340]	ND [360]	ND [380]	ND [350]	ND [330]	ND [420]	ND [320]	ND [410]	ND [330]	ND [410]	ND [330]	ND [370]	ND [350]	ND [350]	ND [340]	ND [360]
3-Methylphenol/4-Methylphenol Coelution	SW8270D	µg/kg	1500	ND [67]	ND [77]	ND [72]	ND [69]	ND [73]	ND [76]	ND [71]	ND [66]	ND [84]	ND [64]	ND [81]	ND [65]	ND [82]	ND [67]	ND [73]	ND [71]	ND [69]	ND [67]	ND [71]
3-Nitroaniline	SW8270D	µg/kg	NE	ND [140]	ND [160]	ND [140]	ND [140]	ND [150]	ND [150]	ND [140]	ND [130]	ND [170]	ND [130]	ND [160]	ND [130]	ND [160]	ND [130]	ND [150]	ND [140]	ND [140]	ND [140]	ND [140]
4-Bromophenyl phenyl ether	SW8270D	µg/kg	NE	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
4-Chloro-3-methylphenol	SW8270D	µg/kg	NE	ND [130]	ND [150]	ND [140]	ND [130]	ND [140]	ND [150]	ND [140]	ND [130]	ND [160]	ND [130]	ND [160]	ND [130]	ND [160]	ND [130]	ND [140]	ND [140]	ND [140]	ND [130]	ND [140]
4-Chloroaniline	SW8270D	µg/kg	57	ND [130]	ND [150]	ND [140]	ND [130]	ND [140]	ND [150]	ND [140]	ND [130]	ND [160]	ND [130]	ND [160]	ND [130]	ND [160]	ND [130]	ND [140]	ND [140]	ND [140]	ND [130]	ND [140]
4-Chlorophenyl phenyl ether	SW8270D	µg/kg	NE	ND [67]	ND [77]	ND [72]	ND [69]	ND [73]	ND [76]	ND [71]	ND [66]	ND [84]	ND [64]	ND [81]	ND [65]	ND [82]	ND [67]	ND [73]	ND [71]	ND [69]	ND [67]	ND [71]
4-Nitroaniline	SW8270D	µg/kg	NE	ND [130]	ND [150]	ND [140]	ND [130]	ND [140]	ND [150]	ND [140]	ND [130]	ND [160]	ND [130]	ND [160]	ND [130]	ND [160]	ND [130]	ND [140]	ND [140]	ND [140]	ND [130]	ND [140]
4-Nitrophenol	SW8270D	µg/kg	NE	ND [340]	ND [390]	ND [360]	ND [340]	ND [360]	ND [380]	ND [350]	ND [330]	ND [420]	ND [320]	ND [410]	ND [330]	ND [410]	ND [330]	ND [370]	ND [350]	ND [350]	ND [340]	ND [360]
Acenaphthene	SW8270D	µg/kg	180000	ND [17]	ND [20]	ND [19]	ND [18]	ND [19]	ND [20]	ND [18]	ND [17]	ND [22]	ND [17]	ND [21]	ND [17]	ND [21]	ND [17]	ND [19]	ND [18]	ND [18]	ND [17]	ND [18]
Acenaphthylene	SW8270D	µg/kg	180000	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
Anthracene	SW8270D	µg/kg	3000000	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
Benzidine	SW8270D	µg/kg	NE	ND [4000]	ND [4600]	ND [4300]	ND [4100]	ND [4400]	ND [4500]	ND [4200]	ND [3900]	ND [5000]	ND [3800]	ND [4900]	ND [3900]	ND [4900]	ND [4000]	ND [4400]	ND [4200]	ND [4100]	ND [4000]	ND [4300]
Benzo(a)anthracene	SW8270D	µg/kg	3600	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
Benzo(a)pyrene	SW8270D	µg/kg	2100	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
Benzo(b)fluoranthene	SW8270D	µg/kg	12000	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
Benzo(g,h,i)perylene	SW8270D	µg/kg	38700000	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
Benzo(k)fluoranthene	SW8270D	µg/kg	120000	ND [67]	ND [77]	ND [72]	ND [69]	ND [73]	ND [76]	ND [71]	ND [66]	ND [84]	ND [64]	ND [81]	ND [65]	ND [82]	ND [67]	ND [73]	ND [71]	ND [69]	ND [67]	ND [71]
Benzoic acid	SW8270D	µg/kg	410000	ND [670]	ND [770]	ND [720]	ND [690]	ND [730]	ND [760]	ND [710]	ND [660]	ND [840]	ND [640]	ND [810]	ND [650]	ND [820]	ND [670]	ND [730]	ND [710]	ND [690]	ND [670]	ND [710]
Benzyl alcohol	SW8270D	µg/kg	NE	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
Benzyl butyl phthalate	SW8270D	µg/kg	920000	ND [67]	ND [77]	ND [72]	ND [69]	ND [73]	ND [76]	ND [71]	ND [66]	ND [84]	ND [64]	ND [81]	ND [65]	ND [82]	ND [67]	ND [73]	ND [71]	ND [69]	ND [67]	ND [71]
Carbazole	SW8270D	µg/kg	6500	ND [68]	ND [78]	ND [73]	ND [70]	ND [74]	ND [77]	ND [72]	ND [67]	ND [85]	ND [65]	ND [82]	ND [66]	ND [83]	ND [68]	ND [75]	ND [72]	ND [70]	ND [68]	ND [73]
Chrysene	SW8270D	µg/kg	360000	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
Di-n-butyl phthalate	SW8270D	µg/kg	80000	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
Di-n-octyl phthalate	SW8270D	µg/kg	3800000	ND [67]	ND [77]	ND [72]	ND [69]	ND [73]	ND [76]	ND [71]	ND [66]	ND [84]	ND [64]	ND [81]	ND [65]	ND [82]	ND [67]	ND [73]	ND [71]	ND [69]	ND [67]	ND [71]
Dibenzo(a,h)anthracene	SW8270D	µg/kg	4000	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
Dibenzofuran	SW8270D	µg/kg	11000	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
Diethyl phthalate	SW8270D	µg/kg	130000	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
Dimethyl phthalate	SW8270D	µg/kg	1100000	ND [34]	ND [39]	ND [36]	ND [34]	30 [36] J	ND [38] Q	200 [35] J,Q	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	57 [41] J	ND [33]	ND [37]	ND [35]	76 [35] J	ND [34]	ND [36]
Fluoranthene	SW8270D	µg/kg	1400000	ND [67]	ND [77]	ND [72]	ND [69]	ND [73]	ND [76]	ND [71]	ND [66]	ND [84]	ND [64]	ND [81]	ND [65]	ND [82]	ND [67]	ND [73]	ND [71]	ND [69]	ND [67]	ND [71]
Fluorene	SW8270D	µg/kg	220000	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
Hexachlorobenzene	SW8270D	µg/kg	47	ND [67]	ND [77]	ND [72]	ND [69]	ND [73]	ND [76]	ND [71]	ND [66]	ND [84]	ND [64]	ND [81]	ND [65]	ND [82]	ND [67]	ND [73]	ND [71]	ND [69]	ND [67]	ND [71]
Hexachlorobutadiene	SW8270D	µg/kg	120	ND [67]	ND [77]	ND [72]	ND [69]	ND [73]	ND [76]	ND [71]	ND [66]	ND [84]	ND [64]	ND [81]	ND [65]	ND [82]	ND [67]	ND [73]	ND [71]	ND [69]	ND [67]	ND [71]
Hexachloroethane	SW8270D	µg/kg	210	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
Indeno(1,2,3-cd)pyrene	SW8270D	µg/kg	41000	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
Isophorone	SW8270D	µg/kg	3100	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
Naphthalene	SW8270D	µg/kg	20000	ND [67]	ND [77]	ND [72]	ND [69]	ND [73]	ND [76]	ND [71]	ND [66]	ND [84]	ND [64]	ND [81]	ND [65]	ND [82]	ND [67]	ND [73]	ND [71]	ND [69]	ND [67]	ND [71]
Nitrobenzene	SW8270D	µg/kg	94	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]

Table A-4 Subsurface Soil Sample Results
Fire Training Pits Investigation
Fort Wainwright, Alaska

Sample ID			ADEC Cleanup Level/ [1,2] EPA Screening Level[3]	13FWFP01SO	13FWFP02SO	13FWFP03SO	13FWFP04SO	13FWFP05SO	13FWFP06SO	13FWFP07SO	13FWFP08SO	13FWFP09SO	13FWFP10SO
Boring ID				AP-10261	AP-10261	AP-10262	AP-10262	AP-10263	AP-10263	AP-10263	AP-10264	AP-10264	AP-10265
Location ID				BH0106	BH0115	BH0206	BH0215	BH0306	BH0317	BH03	BH0406	BH0416	BH0506
Laboratory				TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC
Lab Sample ID				48825-2	48825-3	48825-5	48825-6	48825-8	48825-9	48825-10	48825-12	48825-13	48840-2
Collect Date				10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013
Matrix				SO	SO	SO	SO	SO	SO	SO	SO	SO	SO
Sample Type				Primary	Primary	Primary	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary
Analyte	**Method**	**Units**		**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**
Pentachlorophenol	SW8270D	µg/kg	47	ND [680]	ND [780]	ND [730]	ND [700]	ND [740]	ND [770]	ND [720]	ND [670]	ND [850]	ND [650]
Phenanthrene	SW8270D	µg/kg	3000000	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]
Phenol	SW8270D	µg/kg	68000	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]
Pyrene	SW8270D	µg/kg	1000000	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]
bis(2-Chloroisopropyl)ether	SW8270D	µg/kg	NE	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]
bis-(2-Chloroethoxy)methane	SW8270D	µg/kg	NE	ND [67]	ND [77]	ND [72]	ND [69]	ND [73]	ND [76]	ND [71]	ND [66]	ND [84]	ND [64]
bis-(2-Chloroethyl)ether	SW8270D	µg/kg	2.2	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]
bis-(2-Ethylhexyl)phthalate	SW8270D	µg/kg	13000	ND [67]	ND [77]	ND [72]	ND [69]	ND [73]	ND [76]	ND [71]	ND [66]	ND [84]	ND [64]
n-Nitrosodi-n-propylamine	SW8270D	µg/kg	1.1	ND [67]	ND [77]	ND [72]	ND [69]	ND [73]	ND [76]	ND [71]	ND [66]	ND [84]	ND [64]
n-Nitrosodimethylamine	SW8270D	µg/kg	0.053	ND [67]	ND [77]	ND [72]	ND [69]	ND [73]	ND [76]	ND [71]	ND [66]	ND [84]	ND [64]
n-Nitrosodiphenylamine	SW8270D	µg/kg	15000	ND [34]	ND [39]	ND [36]	ND [34]	ND [36]	ND [38]	ND [35]	ND [33]	ND [42]	ND [32]
n-Nitrosopyrrolidine	SW8270D	µg/kg	NE	ND [130]	ND [150]	ND [140]	ND [130]	ND [140]	ND [150]	ND [140]	ND [130]	ND [160]	ND [130]
4,4'-DDD	SW8081B	µg/kg	7200	ND [0.65]	ND [0.75]	ND [0.71]	ND [0.74]	ND [0.75]	ND [0.76]	ND [0.75]	ND [0.66]	ND [0.83]	ND [0.69]
4,4'-DDE	SW8081B	µg/kg	5100	ND [0.43]	ND [0.50]	ND [0.47]	ND [0.50]	1.6 [0.50] J	ND [0.51]	ND [0.50]	ND [0.44]	ND [0.55]	ND [0.46]
4,4'-DDT	SW8081B	µg/kg	7300	ND [0.65]	ND [0.75]	ND [0.71]	ND [0.74]	3.2 [0.75]	ND [0.76]	ND [0.75]	ND [0.66]	ND [0.83]	ND [0.69]
Aldrin	SW8081B	µg/kg	70	ND [0.43]	ND [0.50]	ND [0.47]	ND [0.50]	ND [0.50]	ND [0.51]	ND [0.50]	ND [0.44]	ND [0.55]	ND [0.46]
alpha-BHC	SW8081B	µg/kg	6.4	ND [0.43]	ND [0.50]	ND [0.47]	ND [0.50]	ND [0.50]	ND [0.51]	ND [0.50]	ND [0.44]	ND [0.55]	ND [0.46]
alpha-Chlordane	SW8081B	µg/kg	2300	ND [0.43]	ND [0.50]	ND [0.47]	ND [0.50]	ND [0.50]	ND [0.51]	ND [0.50]	ND [0.44]	ND [0.55]	ND [0.46]
beta-BHC	SW8081B	µg/kg	22	ND [0.65]	ND [0.75]	ND [0.71]	ND [0.74]	ND [0.75]	ND [0.76]	ND [0.75]	ND [0.66]	ND [0.83]	ND [0.69]
delta-BHC	SW8081B	µg/kg	NE	ND [0.65]	ND [0.75]	ND [0.71]	ND [0.74]	ND [0.75]	ND [0.76]	ND [0.75]	ND [0.66]	ND [0.83]	ND [0.69]
Dieldrin	SW8081B	µg/kg	7.6	ND [0.43]	ND [0.50]	ND [0.47]	ND [0.50]	ND [0.50]	ND [0.51]	ND [0.50]	ND [0.44]	ND [0.55]	ND [0.46]
Endosulfan I	SW8081B	µg/kg	64000	ND [0.43]	ND [0.50]	ND [0.47]	ND [0.50]	ND [0.50]	ND [0.51]	ND [0.50]	ND [0.44]	ND [0.55]	ND [0.46]
Endosulfan II	SW8081B	µg/kg	64000	ND [0.43]	ND [0.50]	ND [0.47]	ND [0.50]	ND [0.50]	ND [0.51]	ND [0.50]	ND [0.44]	ND [0.55]	ND [0.46]
Endosulfan sulfate	SW8081B	µg/kg	NE	ND [0.43]	ND [0.50]	ND [0.47]	ND [0.50]	ND [0.50]	ND [0.51]	ND [0.50]	ND [0.44]	ND [0.55]	ND [0.46]
Endrin	SW8081B	µg/kg	290	ND [0.43]	ND [0.50]	ND [0.47]	ND [0.50]	ND [0.50]	ND [0.51]	ND [0.50]	ND [0.44]	ND [0.55]	ND [0.46]
Endrin aldehyde	SW8081B	µg/kg	NE	ND [0.43]	ND [0.50]	ND [0.47]	ND [0.50]	ND [0.50]	ND [0.51]	ND [0.50]	ND [0.44]	ND [0.55]	ND [0.46]
Endrin ketone	SW8081B	µg/kg	NE	ND [0.65]	ND [0.75]	ND [0.71]	ND [0.74]	ND [0.75]	ND [0.76]	ND [0.75]	ND [0.66]	ND [0.83]	ND [0.69]
gamma-BHC (Lindane)	SW8081B	µg/kg	9.5	ND [0.65]	ND [0.75]	ND [0.71]	ND [0.74]	ND [0.75]	ND [0.76]	ND [0.75]	ND [0.66]	ND [0.83]	ND [0.69]
gamma-Chlordane	SW8081B	µg/kg	2300	ND [0.65]	ND [0.75]	ND [0.71]	ND [0.74]	ND [0.75]	ND [0.76]	ND [0.75]	ND [0.66]	ND [0.83]	ND [0.69]
Heptachlor	SW8081B	µg/kg	280	ND [0.43]	ND [0.50]	ND [0.47]	ND [0.50]	ND [0.50]	ND [0.51]	ND [0.50]	ND [0.44]	ND [0.55]	ND [0.46]
Heptachlor epoxide	SW8081B	µg/kg	14	ND [0.65]	ND [0.75]	ND [0.71]	ND [0.74]	ND [0.75]	ND [0.76]	ND [0.75]	ND [0.66]	ND [0.83]	ND [0.69]
Methoxychlor	SW8081B	µg/kg	23000	ND [0.65]	ND [0.75]	ND [0.71]	ND [0.74]	ND [0.75]	ND [0.76]	ND [0.75]	ND [0.66]	ND [0.83]	ND [0.69]
Toxaphene	SW8081B	µg/kg	3900	ND [25]	ND [30]	ND [28]	ND [29]	ND [29]	ND [30]	ND [29]	ND [26]	ND [32]	ND [27]
PCB-1016 (Aroclor 1016)	SW8082A	µg/kg		ND [9.4]	ND [11]	ND [10]	ND [11]	ND [11]	ND [11]	ND [11]	ND [9.6]	ND [12]	ND [10]
PCB-1221 (Aroclor 1221)	SW8082A	µg/kg		ND [19]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]	ND [22]	ND [19]	ND [24]	ND [20]
PCB-1232 (Aroclor 1232)	SW8082A	µg/kg		ND [14]	ND [16]	ND [15]	ND [16]	ND [16]	ND [17]	ND [16]	ND [14]	ND [18]	ND [15]
PCB-1242 (Aroclor 1242)	SW8082A	µg/kg	1000	ND [9.4]	ND [11]	ND [10]	ND [11]	ND [11]	ND [11]	ND [11]	ND [9.6]	ND [12]	ND [10]
PCB-1248 (Aroclor 1248)	SW8082A	µg/kg		ND [9.4]	ND [11]	ND [10]	ND [11]	ND [11]	ND [11]	ND [11]	ND [9.6]	ND [12]	ND [10]
PCB-1254 (Aroclor 1254)	SW8082A	µg/kg		ND [9.4]	ND [11]	ND [10]	ND [11]	ND [11]	ND [11]	ND [11]	ND [9.6]	ND [12]	ND [10]
PCB-1260 (Aroclor 1260)	SW8082A	µg/kg		ND [9.4]	ND [11]	ND [10]	ND [11]	ND [11]	ND [11]	ND [11]	ND [9.6]	ND [12]	ND [10]
Perfluorobutane Sulfonate (PFBS)	DVLC012	µg/kg	NE	ND [0.57]	ND [0.66]	ND [0.64]	ND [0.61]	ND [0.65]	ND [0.70]	ND [0.69]	0.57 [0.62] J	ND [0.75]	0.29 [0.62] J
Perfluorobutyric acid (PFBTA)	DVLC012	µg/kg	NE	ND [0.57]	ND [0.66]	ND [0.64]	ND [0.61]	ND [0.65]	ND [0.70]	ND [0.69]	ND [0.62]	ND [0.75]	ND [0.62]
Perfluorodecane Sulfonate (PFDCS)	DVLC012	µg/kg	NE	ND [0.57]	ND [0.66]	ND [0.64]	ND [0.61]	0.48 [0.65] J	ND [0.70]	ND [0.69]	ND [0.62]	ND [0.75]	ND [0.62]
Perfluorododecanoic acid (PFDOA)	DVLC012	µg/kg	NE	ND [0.57]	ND [0.66]	ND [0.64]	ND [0.61]	ND [0.65]	ND [0.70]	ND [0.69]	ND [0.62]	ND [0.75]	ND [0.62]
Perfluorohexanoic acid (PFHA)	DVLC012	µg/kg	NE	0.14 [0.57] J	ND [0.66]	ND [0.64]	ND [0.61]	0.22 [0.65] J	ND [0.70]	ND [0.69]	2.9 [0.62]	ND [0.75]	1.3 [0.62]
Perfluoroheptanoic acid (PFHPA)	DVLC012	µg/kg	NE	ND [0.57]	ND [0.66]	ND [0.64]	ND [0.61]	ND [0.65]	ND [0.70]	ND [0.69]	0.55 [0.62] J	ND [0.75]	0.36 [0.62] J
Perfluorohexane Sulfonate (PFHXS)	DVLC012	µg/kg	NE	1.5 [0.57]	0.86 [0.66] J	11 [0.64]	1.5 [0.61]	3.7 [0.65]	ND [0.70]	ND [0.69]	7.3 [0.62]	0.91 [0.75] J	1.7 [0.62] B
Perfluorononanoic acid (PFNA)	DVLC012	µg/kg	NE	ND [0.57]	ND [0.66]	0.31 [0.64] J	ND [0.61]	0.83 [0.65] J	ND [0.70]	ND [0.69]	ND [0.62]	ND [0.75]	0.25 [0.62] J
Perfluorodecanoic acid (PFNDCA)	DVLC012	µg/kg	NE	ND [0.57]	ND [0.66]	ND [0.64]	ND [0.61]	ND [0.65]	ND [0.70]	ND [0.69]	ND [0.62]	ND [0.75]	ND [0.62]
Perfluorooctanoic acid (PFOA)	DVLC012	µg/kg	142 / 2030 [2] (16000)[3]	ND [0.57]	ND [0.66]	2.5 [0.64]	ND [0.61]	ND [0.65]	ND [0.70]	ND [0.69]	ND [0.62]	ND [0.75]	ND [0.62]
Perfluorooctane Sulfonate (PFOS)	DVLC012	µg/kg	571 / 3040 [2] (6000)[3]	ND [0.57]	ND [0.66]	65 [0.64]	4.9 [0.61]	200 [0.65]	0.18 [0.70] J,Q	0.32 [0.69] J,Q	0.28 [0.62] J	ND [0.75]	0.42 [0.62] J
Perfluorooctane Sulfonamide (PFOSA)	DVLC012	µg/kg	NE	ND [0.57]	ND [0.66]	0.14 [0.64] J	ND [0.61]	0.31 [0.65] J	ND [0.70]	ND [0.69]	ND [0.62]	ND [0.75]	ND [0.62]
Perfluoropentanoic acid (PFPA)	DVLC012	µg/kg	NE	ND [0.57]	ND [0.66]	ND [0.64]	ND [0.61]	0.44 [0.65] J	ND [0.70]	ND [0.69]	1.5 [0.62]	ND [0.75]	1.0 [0.62]
Perfluorotetradecanoic acid (PFTEDA)	DVLC012	µg/kg	NE	ND [0.57]	ND [0.66]	ND [0.64]	ND [0.61]	ND [0.65]	ND [0.70]	ND [0.69]	ND [0.62]	ND [0.75]	ND [0.62]
Perfluorotridecanoic acid (PFTRIDA)	DVLC012	µg/kg	NE	ND [0.57]	ND [0.66]	ND [0.64]	ND [0.61]	ND [0.65]	ND [0.70]	ND [0.69]	ND [0.62]	ND [0.75]	ND [0.62]
Perfluoroundecanoic acid (PFUNDCA)	DVLC012	µg/kg	NE	ND [0.57]	ND [0.66]	ND [0.64]	ND [0.61]	ND [0.65]	ND [0.70]	ND [0.69]	ND [0.62]	ND [0.75]	ND [0.62]
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (Hp(	SW8290A	pg/g	NE	ND [0.037]	0.21[0.055]J,B	0.11[0.047] J,B	0.43[0.11] J,B	0.37[0.063] J,B	ND [0.047]	ND [0.068]	0.93 [0.050] J	0.26[0.064] J,B	ND [0.031]
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxins-C13	SW8290A	pg/g	NE	52 [0]	57 [0]	57 [0]	66 [0]	68 [0]	71 [0]	80 [0]	64 [0]	63 [0]	63 [0]
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	SW8290A	pg/g	NE	0.44[0.057]J,B	0.37[0.064]J,B	0.35[0.056] J,B	0.61[0.057] J,B	0.76[0.054] J,B	0.59[0.055] J,B,Q	0.99[0.070]J,B,Q	0.43[0.040] J,B	0.75[0.062] J,B	1.3[0.041] J,B
1,2,3,4,6,7,8-Heptachlorodibenzofurans-C13	SW8290A	pg/g	NE	63 [0]	67 [0]	65 [0]	69 [0]	71 [0]	78 [0]	95 [0]	69 [0]	67 [0]	70 [0]
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	SW8290A	pg/g	NE	ND [0.067]	ND [0.076]	ND [0.066]	ND [0.068]	ND [0.064]	ND [0.065]	ND [0.082]	ND [0.048]	ND [0.073]	ND [0.048]
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD	SW8290A	pg/g	NE	ND [0.042]	ND [0.039]	ND [0.036]	ND [0.081]	ND [0.053]	ND [0.040]	ND [0.051]	ND [0.041]	ND [0.048]	ND [0.033]
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	SW8290A	pg/g	NE	ND [0.075]	ND [0.048]	ND [0.084]	0.16[0.043] J,B	0.12[0.044] J,B	0.13[0.035] J,B	0.19[0.042] J,B	0.095[0.034]J,B	0.24 [0.040] J,B	0.43[0.037] J,B
1,2,3,4,7,8-Hexachlorodibenzofuran-C13	SW8290A	pg/g	NE	70 [0]	77 [0]	75 [0]	74 [0]	76 [0]	81 [0]	88 [0]	81 [0]	77 [0]	73 [0]

Sample ID	13FWFP11SO	13FWFP12SO	13FWFP13SO	13FWFP14SO	13FWFP15SO	13FWFP16SO	13FWFP17SO	13FWFP18SO	13FWFP19SO
Boring ID	AP-10265	AP-10266	AP-10266	AP-10267	AP-10267	AP-10267	AP-10268	AP-10268	AP-10269
Location ID	BH0515	BH0606	BH0616	BH0706	BH0716	BH07	BH0806	BH0816	BH0906
Laboratory	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC
Lab Sample ID	48840-3	48825-16	48825-17	48840-5	48840-6	48840-7	48840-9	48840-10	48840-12
Collect Date	10/31/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013
Matrix	SO	SO	SO	SO	SO	SO	SO	SO	SO
Sample Type	Primary	Primary	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary
Analyte	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**
Pentachlorophenol	ND [820]	ND [660]	ND [830]	ND [680]	ND [750]	ND [720]	ND [700]	ND [680]	ND [730]
Phenanthrene	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
Phenol	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
Pyrene	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
bis(2-Chloroisopropyl)ether	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
bis-(2-Chloroethoxy)methane	ND [81]	ND [65]	ND [82]	ND [67]	ND [73]	ND [71]	ND [69]	ND [67]	ND [71]
bis-(2-Chloroethyl)ether	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
bis-(2-Ethylhexyl)phthalate	ND [81]	ND [65]	ND [82]	ND [67]	ND [73]	ND [71]	ND [69]	ND [67]	ND [71]
n-Nitrosodi-n-propylamine	ND [81]	ND [65]	ND [82]	ND [67]	ND [73]	ND [71]	ND [69]	ND [67]	ND [71]
n-Nitrosodimethylamine	ND [81]	ND [65]	ND [82]	ND [67]	ND [73]	ND [71]	ND [69]	ND [67]	ND [71]
n-Nitrosodiphenylamine	ND [41]	ND [33]	ND [41]	ND [33]	ND [37]	ND [35]	ND [35]	ND [34]	ND [36]
n-Nitrosopyrrolidine	ND [160]	ND [130]	ND [160]	ND [130]	ND [140]	ND [140]	ND [140]	ND [130]	ND [140]
4,4'-DDD	ND [0.86]	ND [0.69]	ND [0.79]	ND [0.72] QL	ND [0.71]	ND [0.75]	ND [0.74] QL	ND [0.71]	ND [0.71]
4,4'-DDE	ND [0.57]	ND [0.46]	ND [0.53]	ND [0.48] QL	ND [0.47]	ND [0.50]	ND [0.49] QL	ND [0.48]	0.74 [0.48] J
4,4'-DDT	ND [0.86]	ND [0.69]	ND [0.79]	1.1 [0.72] J,QL	ND [0.71]	ND [0.75]	ND [0.74] QL	ND [0.71]	1.1 [0.71] J
Aldrin	ND [0.57]	ND [0.46]	ND [0.53]	ND [0.48] QL	ND [0.47]	ND [0.50]	ND [0.49] QL	ND [0.48]	ND [0.48]
alpha-BHC	ND [0.57]	ND [0.46]	ND [0.53]	ND [0.48] QL	ND [0.47]	ND [0.50]	ND [0.49] QL	ND [0.48]	ND [0.48]
alpha-Chlordane	ND [0.57]	ND [0.46]	ND [0.53]	ND [0.48] QL	ND [0.47]	ND [0.50]	ND [0.49] QL	ND [0.48]	ND [0.48]
beta-BHC	ND [0.86]	ND [0.69]	ND [0.79]	ND [0.72] ML,QL	ND [0.71]	ND [0.75]	ND [0.74] QL	ND [0.71]	ND [0.71]
delta-BHC	ND [0.86]	ND [0.69]	ND [0.79]	ND [0.72] QL	ND [0.71]	ND [0.75]	ND [0.74] QL	ND [0.71]	ND [0.71]
Dieldrin	ND [0.57]	ND [0.46]	ND [0.53]	ND [0.48] QL	ND [0.47]	ND [0.50]	ND [0.49] QL	ND [0.48]	ND [0.48]
Endosulfan I	ND [0.57]	ND [0.46]	ND [0.53]	ND [0.48] QL	ND [0.47]	ND [0.50]	ND [0.49] QL	ND [0.48]	ND [0.48]
Endosulfan II	ND [0.57]	ND [0.46]	ND [0.53]	ND [0.48] QL	ND [0.47]	ND [0.50]	ND [0.49] QL	ND [0.48]	ND [0.48]
Endosulfan sulfate	ND [0.57]	ND [0.46]	ND [0.53]	ND [0.48] QL	ND [0.47]	ND [0.50]	ND [0.49] QL	ND [0.48]	ND [0.48]
Endrin	ND [0.57]	ND [0.46]	ND [0.53]	ND [0.48] QL	ND [0.47]	ND [0.50]	ND [0.49] QL	ND [0.48]	ND [0.48]
Endrin aldehyde	ND [0.57]	ND [0.46]	ND [0.53]	ND [0.48] QL	ND [0.47]	ND [0.50]	ND [0.49] QL	ND [0.48]	ND [0.48]
Endrin ketone	ND [0.86]	ND [0.69]	ND [0.79]	ND [0.72] QL	ND [0.71]	ND [0.75]	ND [0.74] QL	ND [0.71]	ND [0.71]
gamma-BHC (Lindane)	ND [0.86]	ND [0.69]	ND [0.79]	ND [0.72] QL	ND [0.71]	ND [0.75]	ND [0.74] QL	ND [0.71]	ND [0.71]
gamma-Chlordane	ND [0.86]	ND [0.69]	ND [0.79]	ND [0.72] QL	ND [0.71]	ND [0.75]	ND [0.74] QL	ND [0.71]	ND [0.71]
Heptachlor	ND [0.57]	ND [0.46]	ND [0.53]	ND [0.48] QL	ND [0.47]	ND [0.50]	ND [0.49] QL	ND [0.48]	ND [0.48]
Heptachlor epoxide	ND [0.86]	ND [0.69]	ND [0.79]	ND [0.72] QL	ND [0.71]	ND [0.75]	ND [0.74] QL	ND [0.71]	ND [0.71]
Methoxychlor	ND [0.86]	ND [0.69]	ND [0.79]	ND [0.72] QL	ND [0.71]	ND [0.75]	ND [0.74] QL	ND [0.71]	ND [0.71]
Toxaphene	ND [34]	ND [27]	ND [31]	ND [28] QL	ND [28]	ND [29]	ND [29] QL	ND [28]	ND [28]
PCB-1016 (Aroclor 1016)	ND [12]	ND [10]	ND [11]	ND [10]	ND [10]	ND [11]	ND [11]	ND [10]	ND [10]
PCB-1221 (Aroclor 1221)	ND [25]	ND [20]	ND [23]	ND [21]	ND [21]	ND [22]	ND [21]	ND [21]	ND [21]
PCB-1232 (Aroclor 1232)	ND [19]	ND [15]	ND [17]	ND [16]	ND [15]	ND [16]	ND [16]	ND [16]	ND [16]
PCB-1242 (Aroclor 1242)	ND [12]	ND [10]	ND [11]	ND [10]	ND [10]	ND [11]	ND [11]	ND [10]	ND [10]
PCB-1248 (Aroclor 1248)	ND [12]	ND [10]	ND [11]	ND [10]	ND [10]	ND [11]	ND [11]	ND [10]	ND [10]
PCB-1254 (Aroclor 1254)	ND [12]	ND [10]	ND [11]	ND [10]	ND [10]	ND [11]	ND [11]	ND [10]	ND [10]
PCB-1260 (Aroclor 1260)	ND [12]	ND [10]	ND [11]	ND [10]	ND [10]	ND [11]	ND [11]	ND [10]	ND [10]
Perfluorobutane Sulfonate (PFBS)	ND [0.77]	1.6 [0.61]	ND [0.73]	4.1 [0.62]	ND [0.61]	ND [0.66]	2.9 [0.67]	ND [0.63]	2.7 [0.64]
Perfluorobutyric acid (PFBTA)	ND [0.77]	ND [0.61]	ND [0.73]	0.99 [0.62]	ND [0.61]	ND [0.66]	0.58 [0.67] J	ND [0.63]	1.3 [0.64]
Perfluorodecane Sulfonate (PFDCS)	ND [0.77]	ND [0.61]	ND [0.73]	ND [0.62]	ND [0.61]	ND [0.66]	ND [0.67]	ND [0.63]	ND [0.64]
Perfluorododecanoic acid (PFDOA)	ND [0.77]	ND [0.61]	ND [0.73]	ND [0.62]	ND [0.61]	ND [0.66]	ND [0.67]	ND [0.63]	ND [0.64]
Perfluorohexanoic acid (PFHA)	ND [0.77]	3.4 [0.61]	ND [0.73]	27 [0.62]	ND [0.61]	ND [0.66]	34 [0.67]	0.30 [0.63] J	10 [0.64]
Perfluoroheptanoic acid (PFHPA)	ND [0.77]	0.26 [0.61] J	ND [0.73]	5.9 [0.62]	ND [0.61]	ND [0.66]	11 [0.67]	ND [0.63]	8.0 [0.64]
Perfluorohexane Sulfonate (PFHXS)	ND [0.77]	0.83 [0.61] B	1.0 [0.73]	160 [0.62]	1.1 [0.61] B	1.0 [0.66] B	3.3 [0.67]	0.87 [0.63] B	55 [0.64]
Perfluorononanoic acid (PFNA)	ND [0.77]	ND [0.61]	ND [0.73]	ND [0.62]	ND [0.61]	ND [0.66]	ND [0.67]	ND [0.63]	0.28 [0.64] J
Perfluorodecanoic acid (PFNDCA)	ND [0.77]	ND [0.61]	ND [0.73]	ND [0.62]	ND [0.61]	ND [0.66]	ND [0.67]	ND [0.63]	ND [0.64]
Perfluorooctanoic acid (PFOA)	ND [0.77]	ND [0.61]	ND [0.73]	16 [0.62]	ND [0.61]	ND [0.66]	0.40 [0.67] J	ND [0.63]	2.7 [0.64]
Perfluorooctane Sulfonate (PFOS)	ND [0.77]	ND [0.61]	1.3 [0.73]	60 [0.62]	1.2 [0.61] Q	0.60 [0.66] J,Q	0.19 [0.67] J	0.31 [0.63] J	23 [0.64]
Perfluorooctane Sulfonamide (PFOSA)	ND [0.77]	ND [0.61]	ND [0.73]	ND [0.62]	ND [0.61]	ND [0.66]	ND [0.67]	ND [0.63]	ND [0.64]
Perfluoropentanoic acid (PFPA)	ND [0.77]	1.1 [0.61]	0.36 [0.73] J	10 [0.62]	ND [0.61]	ND [0.66]	10 [0.67]	ND [0.63]	7.7 [0.64]
Perfluorotetradecanoic acid (PFTEDA)	ND [0.77]	ND [0.61]	ND [0.73]	ND [0.62]	ND [0.61]	ND [0.66]	ND [0.67]	ND [0.63]	ND [0.64]
Perfluorotridecanoic acid (PFTRIDA)	ND [0.77]	ND [0.61]	ND [0.73]	ND [0.62]	ND [0.61]	ND [0.66]	ND [0.67]	ND [0.63]	ND [0.64]
Perfluoroundecanoic acid (PFUNDCA)	ND [0.77]	ND [0.61]	ND [0.73]	ND [0.62]	ND [0.61]	ND [0.66]	ND [0.67]	ND [0.63]	ND [0.64]
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (Hp(	0.12 [0.040] J	ND [0.029]	ND [0.091]	ND [0.066]	ND [0.068]	ND [0.062]	ND [0.054]	ND [0.051]	0.11[0.025] J,B
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxins-C13	67 [0]	78 [0]	57 [0]	52 [0]	58 [0]	60 [0]	52 [0]	62 [0]	66 [0]
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	2.6 [0.054] J,B	0.85[0.047] J,B	0.89[0.078] J,B	1.4[0.076] J,B	1.6[0.073] J,B,Q	3.2[0.070] J,B,Q	1.3[0.066] J,B	1.6[0.066] J,B	0.89[0.030] J,B
1,2,3,4,6,7,8-Heptachlorodibenzofurans-C13	72 [0]	90 [0]	59 [0]	61 [0]	67 [0]	71 [0]	63 [0]	70 [0]	69 [0]
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	ND [0.064]	ND [0.055]	ND [0.092]	ND [0.089]	ND [0.087]	ND [0.082]	ND [0.078]	ND [0.079]	ND [0.035]
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD	ND [0.034]	ND [0.033]	ND [0.061]	ND [0.053]	ND [0.051]	ND [0.048]	ND [0.041]	ND [0.040]	ND [0.026]
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	0.43 [0.042] J,B	0.19[0.039] J,B	0.23[0.055] J,B	0.19[0.060] J,B	0.24[0.051] J,B,Q	0.75[0.053]J,B,Q	0.26[0.053] J,B	0.38[0.049] J,B	0.13[0.018] J,B
1,2,3,4,7,8-Hexachlorodibenzofuran-C13	80 [0]	94 [0]	84 [0]	74 [0]	77 [0]	83 [0]	74 [0]	86 [0]	67 [0]

Table A-4 Subsurface Soil Sample Results
Fire Training Pits Investigation
Fort Wainwright, Alaska

Sample ID			ADEC Cleanup Level/ [1,2] EPA Screening Level[3]	13FWFP01SO	13FWFP02SO	13FWFP03SO	13FWFP04SO	13FWFP05SO	13FWFP06SO	13FWFP07SO	13FWFP08SO	13FWFP09SO	13FWFP10SO
Boring ID				AP-10261	AP-10261	AP-10262	AP-10262	AP-10263	AP-10263	AP-10263	AP-10264	AP-10264	AP-10265
Location ID				BH0106	BH0115	BH0206	BH0215	BH0306	BH0317	BH03	BH0406	BH0416	BH0506
Laboratory				TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC
Lab Sample ID				48825-2	48825-3	48825-5	48825-6	48825-8	48825-9	48825-10	48825-12	48825-13	48840-2
Collect Date				10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013	10/31/2013
Matrix				SO	SO	SO	SO	SO	SO	SO	SO	SO	SO
Sample Type				Primary	Primary	Primary	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary
Analyte	**Method**	**Units**		**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD	SW8290A	pg/g	NE	ND [0.030]	ND [0.028]	ND [0.026]	ND [0.059]	ND [0.039]	ND [0.029]	ND [0.037]	ND [0.030]	ND [0.035]	ND [0.024]
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin-C13	SW8290A	pg/g	NE	66 [0]	70 [0]	72 [0]	64 [0]	65 [0]	73 [0]	73 [0]	71 [0]	74 [0]	71 [0]
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	SW8290A	pg/g	NE	ND [0.036]	ND [0.037]	ND [0.052]	ND [0.033]	ND [0.053]	ND [0.027]	ND [0.032]	ND [0.026]	ND [0.030]	ND [0.028]
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD	SW8290A	pg/g	NE	ND [0.029]	ND [0.027]	ND [0.025]	ND [0.057]	ND [0.038]	ND [0.028]	ND [0.036]	ND [0.029]	ND [0.034]	ND [0.023]
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	SW8290A	pg/g	NE	ND [0.046]	ND [0.047]	ND [0.038]	ND [0.042]	ND [0.043]	ND [0.034]	ND [0.041]	ND [0.033]	ND [0.039]	ND [0.036]
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	SW8290A	pg/g	NE	ND [0.046]	ND [0.051]	ND [0.051]	ND [0.069]	ND [0.060]	ND [0.064]	ND [0.066]	ND [0.054]	ND [0.061]	ND [0.037]
1,2,3,7,8-Pentachlorodibenzo-p-dioxin-C13	SW8290A	pg/g	NE	59 [0]	63 [0]	59 [0]	62 [0]	60 [0]	76 [0]	62 [0]	64 [0]	66 [0]	67 [0]
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	SW8290A	pg/g	NE	ND [0.046]	ND [0.046]	ND [0.041]	ND [0.037]	ND [0.038]	ND [0.032]	ND [0.041]	ND [0.034]	ND [0.044]	ND [0.030]
1,2,3,7,8-Pentachlorodibenzofurans-C13	SW8290A	pg/g	NE	62 [0]	68 [0]	66 [0]	63 [0]	55 [0]	75 [0]	56 [0]	57 [0]	67 [0]	67 [0]
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	SW8290A	pg/g	NE	ND [0.041]	ND [0.042]	ND [0.034]	ND [0.038]	ND [0.038]	ND [0.031]	ND [0.036]	ND [0.029]	ND [0.034]	ND [0.032]
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	SW8290A	pg/g	NE	ND [0.047]	ND [0.048]	ND [0.042]	ND [0.039]	ND [0.039]	ND [0.033]	ND [0.043]	ND [0.036]	ND [0.045]	ND [0.031]
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	SW8290A	pg/g	47	ND [0.036]	ND [0.045]	ND [0.036]	ND [0.038]	ND [0.030]	ND [0.031]	ND [0.034]	ND [0.029]	ND [0.042]	ND [0.027]
2,3,7,8-Tetrachlorodibenzo-p-dioxin-C13	SW8290A	pg/g	NE	59 [0]	62 [0]	64 [0]	65 [0]	63 [0]	71 [0]	64 [0]	65 [0]	67 [0]	65 [0]
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	SW8290A	pg/g	NE	ND [0.025]	ND [0.027]	ND [0.023]	ND [0.021]	ND [0.021]	ND [0.021]	ND [0.023]	ND [0.017]	ND [0.024]	ND [0.018]
2,3,7,8-Tetrachlorodibenzofuran-C13	SW8290A	pg/g	NE	66 [0]	71 [0]	70 [0]	66 [0]	63 [0]	69 [0]	65 [0]	67 [0]	73 [0]	67 [0]
Octachlorodibenzo-p-dioxin (OCDD)	SW8290A	pg/g	NE	0.97[0.057] J,B	1.4[0.060] J,B	0.87[0.043] J,B	4.3 [0.20] J	4.0 [0.11] J	1.2 [0.081] J,B	1.5 [0.11] J,B	19 [0.085]	1.6 [0.086] J,B	0.58[0.068] J,B
Octachlorodibenzo-p-dioxin-C13	SW8290A	pg/g	NE	46 [0]	49 [0]	50 [0]	66 [0]	76 [0]	76 [0]	78 [0]	70 [0]	54 [0]	56 [0]
Octachlorodibenzofuran (OCDF)	SW8290A	pg/g	NE	0.86[0.10]J,B	0.42[0.12] J,B	0.28[0.098] J,B	0.40[0.078]J,B	0.77[0.083] J,B	0.31[0.068] J,B	0.49 [0.12] J,B	0.80[0.069] J,B	1.4 [0.11] J,B	0.79[0.086] J,B
Total Heptachlorodibenzo-p-dioxins (HpCDD)	SW8290A	pg/g	NE	0.099[0.037]J,B	0.38[0.055]J,B	0.28[0.047] J,B	0.72[0.11] J,B	0.81 [0.063] J	ND [0.047] Q	0.22[0.068] J,B,Q	1.7 [0.050] J	0.48[0.064] J,B	0.16 [0.031] J
Total Heptachlorodibenzofurans (HpCDF)	SW8290A	pg/g	NE	0.44[0.062] J,B	0.37[0.070]J,B	0.35[0.061] J,B	0.61[0.062]J,B	0.94[0.059] J,B	0.59[0.060] J,B,Q	0.99[0.076] J,B,Q	0.43[0.044] J,B	0.75[0.067] J,B	1.3 [0.044] J,B
Total Hexachlorodibenzo-p-dioxins (HxCDD)	SW8290A	pg/g	NE	ND [0.042]	ND [0.039]	ND [0.036]	ND [0.081]	ND [0.077]	ND [0.11]	ND [0.30]	ND [0.14]	ND [0.24]	ND [0.067]
Total Hexachlorodibenzofurans (HxCDF)	SW8290A	pg/g	NE	ND [0.075]	ND [0.048]	ND [0.084]	0.16[0.039]J,B	0.12[0.044] J,B	0.13 [0.032] J,B	0.19 [0.038] J,B	0.095[0.031]J,B	0.24[0.036] J,B	0.43[0.033] J,B
Total Pentachlorodibenzo-p-dioxin (PeCDD)	SW8290A	pg/g	NE	ND [0.046]	ND [0.051]	ND [0.051]	ND [0.069]	ND [0.060]	ND [0.064]	ND [0.066]	ND [0.054]	ND [0.061]	ND [0.037]
Total Pentachlorodibenzofurans (PeCDF)	SW8290A	pg/g	NE	ND [0.047]	ND [0.048]	ND [0.042]	ND [0.039]	ND [0.039]	ND [0.033]	ND [0.043]	ND [0.036]	ND [0.045]	ND [0.031]
Total Tetrachlorodibenzo-p-dioxins (TCDD)	SW8290A	pg/g	NE	ND [0.036]	ND [0.045]	0.11[0.036] J	ND [0.038]	ND [0.030]	ND [0.031]	ND [0.034]	ND [0.029]	ND [0.066]	ND [0.027]
Total Tetrachlorodibenzofurans (TCDF)	SW8290A	pg/g	NE	ND [0.025]	ND [0.027]	ND [0.050]	ND [0.021]	0.091[0.021] J	ND [0.021]	ND [0.023]	ND [0.017]	ND [0.024]	ND [0.018]
Total Dioxin/Furan TEQ	SW8290A	pg/g	47 [4,5]	0.005	0.0064	0.0049	0.028	0.025	0.019	0.03	0.029	0.035	0.056

Sample ID	13FWFP11SO	13FWFP12SO	13FWFP13SO	13FWFP14SO	13FWFP15SO	13FWFP16SO	13FWFP17SO	13FWFP18SO	13FWFP19SO
Boring ID	AP-10265	AP-10266	AP-10266	AP-10267	AP-10267	AP-10267	AP-10268	AP-10268	AP-10269
Location ID	BH0515	BH0606	BH0616	BH0706	BH0716	BH07	BH0806	BH0816	BH0906
Laboratory	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC
Lab Sample ID	48840-3	48825-16	48825-17	48840-5	48840-6	48840-7	48840-9	48840-10	48840-12
Collect Date	10/31/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013
Matrix	SO	SO	SO	SO	SO	SO	SO	SO	SO
Sample Type	Primary	Primary	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary
Analyte	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD	ND [0.025]	ND [0.024]	ND [0.044]	ND [0.038]	ND [0.038]	ND [0.035]	ND [0.030]	ND [0.029]	ND [0.030]
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin-C13	75 [0]	95 [0]	68 [0]	74 [0]	80 [0]	82 [0]	76 [0]	87 [0]	79 [0]
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	ND [0.032]	ND [0.072]	ND [0.042]	ND [0.046]	0.064[0.039] J,Q	0.14 [0.041] J,Q	ND [0.041]	0.11 [0.037] J	ND [0.030]
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD	ND [0.024]	ND [0.023]	ND [0.043]	ND [0.037]	ND [0.036]	ND [0.034]	ND [0.029]	ND [0.028]	ND [0.021]
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	ND [0.041]	ND [0.038]	ND [0.053]	ND [0.058]	ND [0.050]	ND [0.052]	ND [0.052]	ND [0.047]	ND [0.019]
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	ND [0.041]	ND [0.036]	ND [0.062]	ND [0.052]	ND [0.057]	ND [0.059]	ND [0.050]	ND [0.050]	ND [0.047]
1,2,3,7,8-Pentachlorodibenzo-p-dioxin-C13	70 [0]	85 [0]	66 [0]	62 [0]	62 [0]	64 [0]	60 [0]	68 [0]	62 [0]
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	ND [0.035]	ND [0.030]	ND [0.047]	ND [0.050]	ND [0.049]	ND [0.048]	ND [0.046]	ND [0.050]	ND [0.034]
1,2,3,7,8-Pentachlorodibenzofurans-C13	69 [0]	84 [0]	64 [0]	63 [0]	64 [0]	66 [0]	61 [0]	71 [0]	66 [0]
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	ND [0.036]	ND [0.034]	ND [0.047]	ND [0.052]	ND [0.044]	ND [0.046]	ND [0.046]	ND [0.042]	ND [0.017]
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	ND [0.036]	ND [0.031]	ND [0.049]	ND [0.052]	ND [0.051]	ND [0.050]	ND [0.048]	ND [0.052]	ND [0.036]
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	ND [0.035]	ND [0.033]	ND [0.041]	ND [0.042]	ND [0.042]	ND [0.044]	ND [0.041]	ND [0.039]	ND [0.025]
2,3,7,8-Tetrachlorodibenzo-p-dioxin-C13	71 [0]	85 [0]	65 [0]	69 [0]	71 [0]	70 [0]	66 [0]	76 [0]	70 [0]
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	ND [0.021]	ND [0.019]	ND [0.028]	ND [0.029]	ND [0.029]	ND [0.028]	ND [0.025]	ND [0.026]	ND [0.027]
2,3,7,8-Tetrachlorodibenzofuran-C13	72 [0]	90 [0]	63 [0]	67 [0]	71 [0]	71 [0]	70 [0]	77 [0]	70 [0]
Octachlorodibenzo-p-dioxin (OCDD)	0.77[0.062] J,B	0.41[0.055]J,B	0.59 [0.18] J,B	0.48[0.090] J,B	0.35[0.083] J,B	0.38 [0.073] J,B	0.29[0.069] J,B	0.51[0.056] J,B	0.55 [0.049] J,B
Octachlorodibenzo-p-dioxin-C13	57 [0]	68 [0]	53 [0]	44 [0]	47 [0]	58 [0]	46 [0]	53 [0]	69 [0]
Octachlorodibenzofuran (OCDF)	2.7 [0.10] J,B	0.57 [0.11] J,B	0.82 [0.18] J,B	1.0 [0.16] J,B	0.69[0.14] J,B,Q	1.4[0.14] J,B,Q	0.72[0.16] J,B	1.2 [0.12] J,B	0.60 [0.052] J,B
Total Heptachlorodibenzo-p-dioxins (HpCDD)	0.27 [0.040] J	0.16[0.029] J,B	0.19[0.091] J,B	ND [0.14]	ND [0.078]	ND [0.090]	ND [0.054]	0.16 [0.051] J	0.27 [0.025] J,B
Total Heptachlorodibenzofurans (HpCDF)	2.6[0.059] J,B	0.85[0.051] J,B	0.89[0.085] J,B	1.4 [0.083] J,B	1.6 [0.080] J,B,Q	3.2[0.076] J,B,Q	1.5 [0.072] J,B	1.6 [0.072] J,B	0.89 [0.032] J,B
Total Hexachlorodibenzo-p-dioxins (HxCDD)	ND [0.034]	ND [0.033]	ND [0.061]	ND [0.053]	ND [0.051]	ND [0.048]	ND [0.041]	ND [0.040]	0.065 [0.026] J
Total Hexachlorodibenzofurans (HxCDF)	0.43[0.038] J,B	0.19[0.046] J,B	0.23[0.049] J,B	0.19[0.054] J,B	0.31[0.046] J,B,Q	1.3[0.048] J,B,Q	0.26[0.048] J,B	0.62[0.044] J,B	0.19 [0.021] J,B
Total Pentachlorodibenzo-p-dioxin (PeCDD)	ND [0.041]	ND [0.036]	ND [0.062]	ND [0.052]	ND [0.057]	ND [0.059]	ND [0.050]	ND [0.050]	ND [0.047]
Total Pentachlorodibenzofurans (PeCDF)	ND [0.036]	ND [0.031]	ND [0.049]	ND [0.052]	ND [0.051]	ND [0.088]	ND [0.048]	ND [0.052]	ND [0.036]
Total Tetrachlorodibenzo-p-dioxins (TCDD)	ND [0.035]	ND [0.033]	0.20 [0.041] J	ND [0.042]	ND [0.042]	ND [0.044]	ND [0.041]	ND [0.039]	0.20 [0.025] J,B
Total Tetrachlorodibenzofurans (TCDF)	ND [0.021]	ND [0.019]	ND [0.028]	ND [0.029]	ND [0.029]	ND [0.028]	0.062[0.025] J	ND [0.026]	ND [0.027]
Total Dioxin/Furan TEQ	0.071	0.028	0.032	0.033	0.047	0.12	0.039	0.066	0.023

Yellow highlighted and **bolded** results exceed ADEC soil cleanup levels (most stringent pathway).

Green highlighted results exceed ADEC's proposed migration to groundwater cleanup level (applies to PFOA or PFOS only).

Grey highlighted results are non-detect with LODs above cleanup levels.

[1] Cleanup levels are from ADEC Title 18, Alaska Administrative Code, Section 75.341, Tables B1 and B2 (ADEC, 2012).

[2] Proposed cleanup levels for PFOA and PFOS (migration to groundwater / human health) are from the Public Comment Draft of 18 AAC 75 dated August 26, 2015.

[3] EPA Region 4 Residential Soil Screening Levels from "Soil Screening Levels for Perfluorooctanoic Acid (PFOA) and Perfluorooctyl Sulfonate (PFOS)"

[4] Total TEQs are presented for each sample (none of which exceed the ADEC cleanup level). Analyte-specific TEQs are presented in the associated laboratory reports. Total TEQ = $\Sigma(C_i * TEF_i)$

[5] TEFs (used to calculate TEQs) are established from the World Health Organization (WHO, 2005).

LOD - limit of detection
LOQ - limit of quantitation
µg/kg - micrograms per kilogram
mg/kg - milligrams per kilogram
NA - not applicable
NE - not established
PFC - perfluorinated compounds
pg/g - picograms per gram
QC - quality control
SO - subsurface soil matrix
SQ - soil QC
TADC - TestAmerica Laboratories of Denver, CO
TEF - toxicity equivalency factor
TEQ - toxicity equivalence, where Total TEQ = $\Sigma(C_i * TEF_i)$

Data Qualifiers:
B - result may be due to cross-contamination
J - result qualified as estimate because it is less than the LOQ
M - result considered an estimate (L - low; H - high) due to matrix interference
ND - non-detect (LOD in parentheses)
Q - result considered an estimate (L - low; H - high) due to a QC failure
R - result rejected due to QC issue

Table A-4 Subsurface Soil Sample Results
Fire Training Pits Investigation
Fort Wainwright, Alaska

Sample ID			ADEC Cleanup Level/ [1,2] EPA Screening Level [3]	13FWFP20SO	13FWFP21SO	13FWFP22S0	13FWFP23SO	13FWFP24SO	13FWFP25SO	13FWFP26SO	13FWFP27SO	13FWFP28SO	13FWFP29SO	13FWFP30SO	13FWFP31SO	13FWFP32SO	13FWFP33SO	13FWFP34SO	13FWFP35SO	13FWFP36SO	13FWFP37SO	13FWFP38SO
Boring ID				AP-10269	AP-10270	AP-10270	AP-10271	AP-10271	AP-10271	AP-10272	AP-10272	AP-10272	AP-10273	AP-10273	AP-10274	AP-10274	AP-10275	AP-10275	AP-10276	AP-10276	AP-10277	AP-10277
Location ID				BH0918	BH1006	BH1016	BH1106	BH11	BH1116	BH1206	BH1216	BH12	BH1306	BH1319	BH1406	BH1416	BH1505	BH1516	BH1605	BH1611	BH1705	BH1716
Laboratory				TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC
Lab Sample ID				48840-13	48809-10	48809-11	48840-15	48840-16	48840-17	48809-13	48809-14	48809-15	48809-17	48809-18	48809-2	48809-3	48809-6	48809-7	48971-2	48971-3	48971-5	48971-6
Collect Date				11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013
Matrix				SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO
Sample Type				Primary	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary
Analyte	**Method**	**Units**		**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**
Gasoline Range Organics (C6-C10)	AK101	mg/kg	300	0.51[0.47] J,B	0.58[0.47] J,B	0.33[0.47] J,B	ND[0.78] B,QL	ND[0.75] B,QL	0.79[0.67] J,QL	0.56 [0.36] B	0.74[0.67]J,QL,Q,B	0.31[0.68]J,QL,Q,B	1.50 [0.41] B	0.61[0.56]J,QL,B	0.36 [0.51] J,B	0.54[0.47] J,B	0.52[0.61]J,M,B	1.60[0.47] B	1.7[0.440] B	0.41[0.70]J,B,QL	2.10[0.46]B	0.65[0.68]J,B,QL
Diesel Range Organics (C10-C25)	AK102	mg/kg	250	1.6 [2.1] J	1.4 [2.1] J	ND [2.2]	1.7 [2.5] J	1.5 [2.4] J	2.1 [2.4] J	ND [2.0]	ND [2.5]	ND [2.5]	1.3 [2.1] J	1.4 [2.3] J	4.2 [2.1] J	2.0 [2.2] J	3.7 [2.3] J	1.7 [2.1] J	8.7 [2.0]	2.3 [2.5] J,QL	1.4 [1.9] J	ND [2.5]
Residual Range Organics (C25-C36)	AK103	mg/kg	11000	ND [10]	ND [10]	ND [11]	ND [12]	ND [12]	ND [12]	ND [10]	ND [13]	ND [12]	ND [10]	ND [11]	ND [11]	ND [11]	14 [12]	ND [11]	43 [10]	ND [13]	ND [9.6]	ND [13]
Arsenic	SW6020A	µg/kg	3900	3100 [160]	**5500 [150]**	2200 [140]	**12000 [190]**	**13000 [170]**	**3700 [160]**	3600 [130]	2100 [160]	2100 [170]	**5800 [160]**	1700 [150]	**9300 [150]**	**4300 [170]**	**12000 [170]**	**2900 [160]**	**4400 [140]**	2500 [180]	**6800 [150]**	3000 [170]
Barium	SW6020A	µg/kg	1100000	160000 [210]	73000 [210]	45000 [190]	130000 [250]	120000 [230]	57000 [210]	120000 [170]	51000 [220]	53000 [220]	64000 [210]	42000 [200]	100000 [210]	38000 [220]	130000 [230] J	58000 [210]	79000 [180]	69000 [230]	83000 [200]	55000 [230]
Cadmium	SW6020A	µg/kg	5000	64 [26] J	97 [26] J	38 [23] J	230 [31]	260 [28]	96 [27] J	170 [22]	79 [27] J	80 [28] J	92 [26] J	27 [25] J	190 [26]	83 [28] J	280 [28]	100 [27] J	120 [23]	92 [29] J	98 [25]	81 [29] J
Chromium	SW6020A	µg/kg	25000	7700 [180]	13000 [180]	6600 [160]	22000 [220]	21000 [200]	12000 [190]	12000 [150]	9200 [190]	9700 [190]	12000 [180]	7100 [170]	17000 [180]	7300 [190]	20000 [200]	9600 [190]	14000 [160]	11000 [200]	15000 [170]	11000 [200]
Lead	SW6020A	µg/kg	400000	1800 [52]	4400 [52]	3000 [47]	7600 [62]	7800 [57]	3300 [53]	3400 [43]	3100 [54]	3000 [55]	3800 [52]	2000 [49]	5800 [51]	2200 [55]	7300 [56]	2600 [53]	4500 [46]	3200 [59]	4500 [49]	3100 [57]
Selenium	SW6020A	µg/kg	3400	640 [260]	140 [260] J	ND [230]	1800 [310]	1800 [280]	900 [270]	ND [220]	ND [270]	ND [280]	ND [260]	ND [250]	1400 [260]	610 [280]	1700 [280]	820 [270]	230 [230] J	ND [290]	170 [250] J	ND [290]
Silver	SW6020A	µg/kg	11200	26 [63] J	47 [62] J	21 [56] J	86 [75] J	79 [68] J	33 [64] J	52 [52] J	22 [65] J	24 [66] J	34 [62] J	20 [59] J	61 [62] J	40 [66] J	71 [68] J	33 [64] J	43 [55] J	31 [70] J	32 [59] J	ND [69]
Mercury	SW7471B	µg/kg	1400	ND [18]	6.1 [15] J	ND [15]	20 [17] J	23 [19] J	ND [17]	24 [14]	ND [18]	ND [21]	18 [14]	ND [18]	28 [15]	ND [16]	21 [19] J	ND [16]	16 [15] J	7.6 [18] J	13 [14] J	ND [19]
1,1,1,2-Tetrachloroethane	SW8260B	µg/kg	NE	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
1,1,1-Trichloroethane	SW8260B	µg/kg	820	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15] ML	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
1,1,2,2-Tetrachloroethane	SW8260B	µg/kg	17	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
1,1,2-Trichloroethane	SW8260B	µg/kg	18	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
1,1-Dichloroethane	SW8260B	µg/kg	25000	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15] ML	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
1,1-Dichloroethene	SW8260B	µg/kg	30	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15] ML	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
1,1-Dichloropropene	SW8260B	µg/kg	NE	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15] ML	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
1,2,3-Trichlorobenzene	SW8260B	µg/kg	NE	ND [18]	ND [18]	ND [18]	ND [29]	ND [28]	ND [25]	ND [13]	ND [25]	ND [26]	ND [15]	ND [21]	ND [19]	ND [18]	ND [23]	ND [18]	ND [16]	ND [26]	ND [17]	ND [25]
1,2,3-Trichloropropane	SW8260B	µg/kg	0.53	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
1,2,4-Trichlorobenzene	SW8260B	µg/kg	850	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
1,2,4-Trimethylbenzene	SW8260B	µg/kg	23000	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
1,2-Dibromo-3-chloropropane	SW8260B	µg/kg	NE	ND [59]	ND [58]	ND [59]	ND [98]	ND [92]	ND [83]	ND [45]	ND [83]	ND [85]	ND [51]	ND [69]	ND [63]	ND [58]	ND [76]	ND [58]	ND [54]	ND [88]	ND [57]	ND [85]
1,2-Dibromoethane	SW8260B	µg/kg	0.16	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
1,2-Dichlorobenzene	SW8260B	µg/kg	5100	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
1,2-Dichloroethane	SW8260B	µg/kg	16	ND [9.4]	ND [9.3]	ND [9.4]	ND [16]	ND [15]	ND [13]	ND [7.2]	ND [13]	ND [14]	ND [8.1]	ND [11]	ND [10]	ND [9.3]	ND [12] ML	ND [9.4]	ND [8.6]	ND [14]	ND [9.1]	ND [14]
1,2-Dichloroethene, Total	SW8260B	µg/kg	NE	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
1,2-Dichloropropane	SW8260B	µg/kg	18	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
1,3,5-Trimethylbenzene	SW8260B	µg/kg	23000	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
1,3-Dichlorobenzene	SW8260B	µg/kg	28000	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
1,3-Dichloropropane	SW8260B	µg/kg	33	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
1,4-Dichlorobenzene	SW8260B	µg/kg	640	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
2,2-Dichloropropane	SW8260B	µg/kg	NE	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
2-Butanone	SW8260B	µg/kg	59000	ND [47]	ND [47]	ND [47]	ND [78]	ND [74]	ND [67]	ND [36]	ND [66]	ND [68]	ND [40]	ND [56]	ND [51]	ND [47]	ND [61]	ND [47]	ND [43]	ND [70]	ND [45]	ND [68]
2-Chlorotoluene	SW8260B	µg/kg	NE	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
2-Hexanone	SW8260B	µg/kg	NE	ND [47]	ND [47]	ND [47]	ND [78]	ND [74]	ND [67]	ND [36]	ND [66]	ND [68]	ND [40]	ND [56]	ND [51]	ND [47]	ND [61] R	ND [47]	ND [43]	ND [70]	ND [45]	ND [68]
4-Chlorotoluene	SW8260B	µg/kg	NE	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
4-Isopropyltoluene	SW8260B	µg/kg	NE	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
4-Methyl-2-pentanone	SW8260B	µg/kg	8100	ND [47]	ND [47]	ND [47]	ND [78]	ND [74]	ND [67]	ND [36]	ND [66]	ND [68]	ND [40]	ND [56]	ND [51]	ND [47]	ND [61] ML	ND [47]	ND [43]	ND [70]	ND [45]	ND [68]
Acetone	SW8260B	µg/kg	88000	ND [120]	ND [120]	ND [120]	ND [200]	ND [180]	ND [170]	ND [90]	ND [170]	ND [170]	ND [100]	ND [140]	ND [130]	ND [120]	ND [150]	ND [120]	ND [110]	ND [180]	ND [110]	ND [170]
Benzene	SW8260B	µg/kg	25	ND [4.7]	ND [4.7]	ND [4.7]	ND [7.8]	ND [7.4]	ND [6.7]	ND [3.6]	ND [6.6]	ND [6.8]	ND [4.0]	ND [5.6]	ND [5.1]	ND [4.7]	ND [6.1] ML	ND [4.7]	ND [4.3]	ND [7.0]	ND [4.5]	ND [6.8]
Bromobenzene	SW8260B	µg/kg	NE	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
Bromochloromethane	SW8260B	µg/kg	NE	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15] ML	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
Bromodichloromethane	SW8260B	µg/kg	44	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
Bromoform	SW8260B	µg/kg	340	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
Bromomethane	SW8260B	µg/kg	160	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15] ML	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
Carbon disulfide	SW8260B	µg/kg	12000	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15] R, ML	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
Carbon tetrachloride	SW8260B	µg/kg	23	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15] ML	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
Chlorobenzene	SW8260B	µg/kg	630	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
Chloroethane	SW8260B	µg/kg	580000	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15] ML	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
Chloroform	SW8260B	µg/kg	460	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
Chloromethane	SW8260B	µg/kg	210	ND [15]	ND [15]	ND [15]	ND [24]	ND [23]	ND [21]	ND [11]	ND [21]	ND [21]	ND [13]	ND [17]	ND [16]	ND [15]	ND [19] R	ND [15]	ND [13]	ND [22]	ND [14]	ND [21]
Dibromochloromethane	SW8260B	µg/kg	32	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
Dibromomethane	SW8260B	µg/kg	1100	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15] ML	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
Dichlorodifluoromethane	SW8260B	µg/kg	140000	ND [23]	ND [23]	ND [23]	ND [39]	ND [37]	ND [33]	ND [18]	ND [33]	ND [34]	ND [20]	ND [28]	ND [25]	ND [23]	ND [30] ML	ND [23]	ND [22]	ND [35]	ND [23]	ND [34]
Ethylbenzene	SW8260B	µg/kg	6900	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
Hexachlorobutadiene	SW8260B	µg/kg	120	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
Isopropylbenzene	SW8260B	µg/kg	51000	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
Methyl-tert-butyl ether (MTBE)	SW8260B	µg/kg	1300	ND [59]	ND [58]	ND [59]	ND [98]	ND [92]	ND [83]	ND [45]	ND [83]	ND [85]	ND [51]	ND [69]	ND [63]	ND [58]	ND [76]	ND [58]	ND [54]	ND [88]	ND [57]	ND [85]
Methylene chloride	SW8260B	µg/kg	16	ND [23]	ND [23]	ND [23]	ND [39]	ND [37]	ND [33]	ND [18]	ND [33]	ND [34]	ND [20]	ND [28]	ND [25]	ND [23]	ND [30] ML	ND [23]	ND [22]	ND [35]	ND [23]	ND [34]
Naphthalene	SW8260B	µg/kg	20000	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
Styrene	SW8260B	µg/kg	960	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
Tetrachloroethene (PCE)	SW8260B	µg/kg	24	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15] ML	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
Toluene	SW8260B	µg/kg	6500	7.5 [12] J	ND [12]	ND [12]	9.4 [20] J	7.6 [18] J	8.3 [17] J	3.8 [9.0] J,B	6.7 [17] J,B,Q	ND [17] Q	10 [10] J,B	6.1 [14] J,B	ND [13]	ND [12]	ND [15] ML	7.2 [12] J,B	11 [11] J,B	ND [18]	14 [11] J,B	7.3 [17] J,B
Trichloroethene (TCE)	SW8260B	µg/kg	20	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	6.4 [17] J	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	11 [13] J	ND [12]	9.0 [15] J,ML	4.5 [12] J	6.5 [11] J	11 [18] J	4.7 [11] J	ND [17]
Trichlorofluoromethane	SW8260B	µg/kg	86000	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
Vinyl chloride	SW8260B	µg/kg	8.5	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15] ML	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]

Table A-4 Subsurface Soil Sample Results
Fire Training Pits Investigation
Fort Wainwright, Alaska

Sample ID			ADEC Cleanup Level/ 1,2 EPA Screening Level3	13FWFP20SO	13FWFP21SO	13FWFP22S0	13FWFP23SO	13FWFP24SO	13FWFP25SO	13FWFP26SO	13FWFP27SO	13FWFP28SO	13FWFP29SO	13FWFP30SO	13FWFP31SO	13FWFP32SO	13FWFP33SO	13FWFP34SO	13FWFP35SO	13FWFP36SO	13FWFP37SO	13FWFP38SO
Boring ID				AP-10269	AP-10270	AP-10270	AP-10271	AP-10271	AP-10271	AP-10272	AP-10272	AP-10272	AP-10273	AP-10273	AP-10274	AP-10274	AP-10275	AP-10275	AP-10276	AP-10276	AP-10277	AP-10277
Location ID				BH0918	BH1006	BH1016	BH1106	BH11	BH1116	BH1206	BH1216	BH12	BH1306	BH1319	BH1406	BH1416	BH1505	BH1516	BH1605	BH1611	BH1705	BH1716
Laboratory				TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC
Lab Sample ID				48840-13	48809-10	48809-11	48840-15	48840-16	48840-17	48809-13	48809-14	48809-15	48809-17	48809-18	48809-2	48809-3	48809-6	48809-7	48971-2	48971-3	48971-5	48971-6
Collect Date				11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013
Matrix				SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO
Sample Type				Primary	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary
Analyte	**Method**	**Units**		**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**
Xylene, Isomers m & p	SW8260B	µg/kg	63000	ND [23]	ND [23]	ND [23]	ND [39]	ND [37]	ND [33]	ND [18]	ND [33]	ND [34]	ND [20]	ND [28]	ND [25]	ND [23]	ND [30] ML	ND [23]	ND [22]	ND [35]	ND [23]	ND [34]
cis-1,2-Dichloroethene	SW8260B	µg/kg	240	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15] ML	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
cis-1,3-Dichloropropene	SW8260B	µg/kg	33	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
n-Butylbenzene	SW8260B	µg/kg	15000	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
n-Propylbenzene	SW8260B	µg/kg	15000	ND [18]	ND [18]	ND [18]	ND [29]	ND [28]	ND [25]	ND [13]	ND [25]	ND [26]	ND [15]	ND [21]	ND [19]	ND [18]	ND [23]	ND [18]	ND [16]	ND [26]	ND [17]	ND [25]
o-Xylene	SW8260B	µg/kg	63000	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
sec-Butylbenzene	SW8260B	µg/kg	12000	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
tert-Butylbenzene	SW8260B	µg/kg	12000	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
trans-1,2-Dichloroethene	SW8260B	µg/kg	370	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15] ML	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
trans-1,3-Dichloropropene	SW8260B	µg/kg	33	ND [12]	ND [12]	ND [12]	ND [20]	ND [18]	ND [17]	ND [9.0]	ND [17]	ND [17]	ND [10]	ND [14]	ND [13]	ND [12]	ND [15]	ND [12]	ND [11]	ND [18]	ND [11]	ND [17]
1,2,4-Trichlorobenzene	SW8270D	µg/kg	850	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
1,2-Dichlorobenzene	SW8270D	µg/kg	5100	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
1,2-Diphenylhydrazine	SW8270D	µg/kg	28000	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
1,3-Dichlorobenzene	SW8270D	µg/kg	22000	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
1,4-Dichlorobenzene	SW8270D	µg/kg	6200	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
2,4,5-Trichlorophenol	SW8270D	µg/kg	67000	ND [140]	ND [130]	ND [140]	ND [160]	ND [160]	ND [150]	ND [130]	ND [160]	ND [160]	ND [140]	ND [140]	ND [140]	ND [140]	ND [140]	ND [140]	ND [140]	ND [170]	ND [130]	ND [160]
2,4,6-Trichlorophenol	SW8270D	µg/kg	1400	ND [70]	ND [68]	ND [72]	ND [83]	ND [84]	ND [78]	ND [66]	ND [79]	ND [81]	ND [69]	ND [72]	ND [70]	ND [70]	ND [72]	ND [71]	ND [69]	ND [85]	ND [66]	ND [79]
2,4-Dichlorophenol	SW8270D	µg/kg	1300	ND [70]	ND [68]	ND [72]	ND [83]	ND [84]	ND [78]	ND [66]	ND [79]	ND [81]	ND [69]	ND [72]	ND [70]	ND [70]	ND [72]	ND [71]	ND [69]	ND [85]	ND [66]	ND [79]
2,4-Dimethylphenol	SW8270D	µg/kg	8800	ND [140]	ND [130]	ND [140]	ND [160]	ND [160]	ND [150]	ND [130]	ND [160]	ND [160]	ND [140]	ND [140]	ND [140]	ND [140]	ND [140]	ND [140]	ND [140]	ND [170]	ND [130]	ND [160]
2,4-Dinitrophenol	SW8270D	µg/kg	540	ND [720]	ND [690]	ND [730]	ND [840]	ND [850]	ND [790]	ND [670]	ND [800]	ND [820]	ND [700]	ND [730]	ND [710]	ND [710]	ND [730]	ND [720]	ND [700]	ND [860]	ND [670]	ND [800]
2,4-Dinitrotoluene	SW8270D	µg/kg	9.3	ND [140]	ND [130]	ND [140]	ND [160]	ND [160]	ND [150]	ND [130]	ND [160]	ND [160]	ND [140]	ND [140]	ND [140]	ND [140]	ND [140]	ND [140]	ND [140]	ND [170]	ND [130]	ND [160]
2,6-Dichlorophenol	SW8270D	µg/kg	NE	ND [140]	ND [130]	ND [140]	ND [160]	ND [160]	ND [150]	ND [130]	ND [160]	ND [160]	ND [140]	ND [140]	ND [140]	ND [140]	ND [140]	ND [140]	ND [140]	ND [170]	ND [130]	ND [160]
2,6-Dinitrotoluene	SW8270D	µg/kg	9.4	ND [70]	ND [68]	ND [72]	ND [83]	ND [84]	ND [78]	ND [66]	ND [79]	ND [81]	ND [69]	ND [72]	ND [70]	ND [70]	ND [72]	ND [71]	ND [69]	ND [85]	ND [66]	ND [79]
2-Chloronaphthalene	SW8270D	µg/kg	120000	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
2-Chlorophenol	SW8270D	µg/kg	1500	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
2-Methyl-4,6-dinitrophenol	SW8270D	µg/kg	NE	ND [700]	ND [680]	ND [720]	ND [830]	ND [840]	ND [780]	ND [660]	ND [790]	ND [810]	ND [690]	ND [720]	ND [700]	ND [700]	ND [720]	ND [710]	ND [690]	ND [850]	ND [660]	ND [790]
2-Methylnaphthalene	SW8270D	µg/kg	6100	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
2-Methylphenol (o-Cresol)	SW8270D	µg/kg	15000	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
2-Nitroaniline	SW8270D	µg/kg	NE	ND [70]	ND [68]	ND [72]	ND [83]	ND [84]	ND [78]	ND [66]	ND [79]	ND [81]	ND [69]	ND [72]	ND [70]	ND [70]	ND [72]	ND [71]	ND [69]	ND [85]	ND [66]	ND [79]
2-Nitrophenol	SW8270D	µg/kg	NE	ND [70]	ND [68]	ND [72]	ND [83]	ND [84]	ND [78]	ND [66]	ND [79]	ND [81]	ND [69]	ND [72]	ND [70]	ND [70]	ND [72]	ND [71]	ND [69]	ND [85]	ND [66]	ND [79]
3,3'-Dichlorobenzidine	SW8270D	µg/kg	190	ND [350]	ND [340]	ND [360]	ND [410]	ND [420]	ND [390]	ND [330]	ND [390]	ND [400]	ND [350]	ND [360]	ND [350]	ND [350]	ND [360]	ND [350]	ND [350]	ND [420]	ND [330]	ND [400]
3-Methylphenol/4-Methylphenol Coelution	SW8270D	µg/kg	1500	ND [70]	ND [68]	ND [72]	ND [83]	ND [84]	ND [78]	ND [66]	ND [79]	ND [81]	ND [69]	ND [72]	ND [70]	ND [70]	ND [72]	ND [71]	ND [69]	ND [85]	ND [66]	ND [79]
3-Nitroaniline	SW8270D	µg/kg	NE	ND [140]	ND [140]	ND [150]	ND [170]	ND [170]	ND [160]	ND [130]	ND [160]	ND [160]	ND [140]	ND [150]	ND [140]	ND [140]	ND [140]	ND [140]	ND [140]	ND [170]	ND [130]	ND [160]
4-Bromophenyl phenyl ether	SW8270D	µg/kg	NE	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
4-Chloro-3-methylphenol	SW8270D	µg/kg	NE	ND [140]	ND [130]	ND [140]	ND [160]	ND [160]	ND [150]	ND [130]	ND [160]	ND [160]	ND [140]	ND [140]	ND [140]	ND [140]	ND [140]	ND [140]	ND [140]	ND [170]	ND [130]	ND [160]
4-Chloroaniline	SW8270D	µg/kg	57	ND [140]	ND [130]	ND [140]	ND [160]	ND [160]	ND [150]	ND [130]	ND [160]	ND [160]	ND [140]	ND [140]	ND [140]	ND [140]	ND [140]	ND [140]	ND [140]	ND [170]	ND [130]	ND [160]
4-Chlorophenyl phenyl ether	SW8270D	µg/kg	NE	ND [70]	ND [68]	ND [72]	ND [83]	ND [84]	ND [78]	ND [66]	ND [79]	ND [81]	ND [69]	ND [72]	ND [70]	ND [70]	ND [72]	ND [71]	ND [69]	ND [85]	ND [66]	ND [79]
4-Nitroaniline	SW8270D	µg/kg	NE	ND [140]	ND [130]	ND [140]	ND [160]	ND [160]	ND [150]	ND [130]	ND [160]	ND [160]	ND [140]	ND [140]	ND [140]	ND [140]	ND [140]	ND [140]	ND [140]	ND [170]	ND [130]	ND [160]
4-Nitrophenol	SW8270D	µg/kg	NE	ND [350]	ND [340]	ND [360]	ND [410]	ND [420]	ND [390]	ND [330]	ND [390]	ND [400]	ND [350]	ND [360]	ND [350]	ND [350]	ND [360]	ND [350]	ND [350]	ND [420]	ND [330]	ND [400]
Acenaphthene	SW8270D	µg/kg	180000	ND [18]	ND [17]	ND [19]	ND [21]	ND [22]	ND [20]	ND [17]	ND [20]	ND [21]	ND [18]	ND [19]	ND [18]	ND [18]	ND [19]	ND [18]	ND [18]	ND [22]	ND [17]	ND [20]
Acenaphthylene	SW8270D	µg/kg	180000	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
Anthracene	SW8270D	µg/kg	3000000	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
Benzidine	SW8270D	µg/kg	NE	ND [4200]	ND [4100]	ND [4300]	ND [5000]	ND [5000]	ND [4700]	ND [4000]	ND [4700]	ND [4900]	ND [4200]	ND [4300]	ND [4200]	ND [4200]	ND [4300]	ND [4300]	ND [4200]	ND [5100]	ND [4000]	ND [4700]
Benzo(a)anthracene	SW8270D	µg/kg	3600	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
Benzo(a)pyrene	SW8270D	µg/kg	2100	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
Benzo(b)fluoranthene	SW8270D	µg/kg	12000	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
Benzo(g,h,i)perylene	SW8270D	µg/kg	38700000	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
Benzo(k)fluoranthene	SW8270D	µg/kg	120000	ND [70]	ND [68]	ND [72]	ND [83]	ND [84]	ND [78]	ND [66]	ND [79]	ND [81]	ND [69]	ND [72]	ND [70]	ND [70]	ND [72]	ND [71]	ND [69]	ND [85]	ND [66]	ND [79]
Benzoic acid	SW8270D	µg/kg	410000	ND [700]	ND [680]	ND [720]	ND [830]	ND [840]	ND [780]	ND [660]	ND [790]	ND [810]	ND [690]	ND [720]	ND [700]	ND [700]	ND [720]	ND [710]	ND [690]	ND [850]	ND [660]	ND [790]
Benzyl alcohol	SW8270D	µg/kg	NE	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
Benzyl butyl phthalate	SW8270D	µg/kg	920000	ND [70]	ND [68]	ND [72]	ND [83]	ND [84]	ND [78]	ND [66]	ND [79]	ND [81]	ND [69]	ND [72]	ND [70]	ND [70]	ND [72]	ND [71]	ND [69]	ND [85]	ND [66]	ND [79]
Carbazole	SW8270D	µg/kg	6500	ND [72]	ND [69]	ND [73]	ND [84]	ND [85]	ND [79]	ND [67]	ND [80]	ND [82]	ND [70]	ND [73]	ND [71]	ND [71]	ND [73]	ND [72]	ND [70]	ND [86]	ND [67]	ND [80]
Chrysene	SW8270D	µg/kg	360000	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
Di-n-butyl phthalate	SW8270D	µg/kg	80000	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
Di-n-octyl phthalate	SW8270D	µg/kg	3800000	ND [70]	ND [68]	ND [72]	ND [83]	ND [84]	ND [78]	ND [66]	ND [79]	ND [81]	ND [69]	ND [72]	ND [70]	ND [70]	ND [72]	ND [71]	ND [69]	ND [85]	ND [66]	ND [79]
Dibenzo(a,h)anthracene	SW8270D	µg/kg	4000	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
Dibenzofuran	SW8270D	µg/kg	11000	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
Diethyl phthalate	SW8270D	µg/kg	130000	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
Dimethyl phthalate	SW8270D	µg/kg	1100000	ND [35]	ND [34]	ND [36]	120 [41] J,B	110 [42] J,B	530 [39] B	ND [33]	36 [39] J	ND [40]	ND [35]	ND [36]	170 [35] J	140 [35] J	150 [36] J	39 [35] J	47 [35] J	35 [42] J	23 [33] J	30 [40] J
Fluoranthene	SW8270D	µg/kg	1400000	ND [70]	ND [68]	ND [72]	ND [83]	ND [84]	ND [78]	ND [66]	ND [79]	ND [81]	ND [69]	ND [72]	ND [70]	ND [70]	ND [72]	ND [71]	ND [69]	ND [85]	ND [66]	ND [79]
Fluorene	SW8270D	µg/kg	220000	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
Hexachlorobenzene	SW8270D	µg/kg	47	ND [70]	ND [68]	ND [72]	ND [83]	ND [84]	ND [78]	ND [66]	ND [79]	ND [81]	ND [69]	ND [72]	ND [70]	ND [70]	ND [72]	ND [71]	ND [69]	ND [85]	ND [66]	ND [79]
Hexachlorobutadiene	SW8270D	µg/kg	120	ND [70]	ND [68]	ND [72]	ND [83]	ND [84]	ND [78]	ND [66]	ND [79]	ND [81]	ND [69]	ND [72]	ND [70]	ND [70]	ND [72]	ND [71]	ND [69]	ND [85]	ND [66]	ND [79]
Hexachloroethane	SW8270D	µg/kg	210	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
Indeno(1,2,3-cd)pyrene	SW8270D	µg/kg	41000	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
Isophorone	SW8270D	µg/kg	3100	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
Naphthalene	SW8270D	µg/kg	20000	ND [70]	ND [68]	ND [72]	ND [83]	ND [84]	ND [78]	ND [66]	ND [79]	ND [81]	ND [69]	ND [72]	ND [70]	ND [70]	ND [72]	ND [71]	ND [69]	ND [85]	ND [66]	ND [79]
Nitrobenzene	SW8270D	µg/kg	94	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]

Table A-4 Subsurface Soil Sample Results
Fire Training Pits Investigation
Fort Wainwright, Alaska

Sample ID			ADEC Cleanup Level/[1,2] EPA Screening Level[3]	13FWFP20SO	13FWFP21SO	13FWFP22S0	13FWFP23SO	13FWFP24SO	13FWFP25SO	13FWFP26SO	13FWFP27SO	13FWFP28SO	13FWFP29SO	13FWFP30SO	13FWFP31SO	13FWFP32SO	13FWFP33SO	13FWFP34SO	13FWFP35SO	13FWFP36SO	13FWFP37SO	13FWFP38SO
Boring ID				AP-10269	AP-10270	AP-10270	AP-10271	AP-10271	AP-10271	AP-10272	AP-10272	AP-10272	AP-10273	AP-10273	AP-10274	AP-10274	AP-10275	AP-10275	AP-10276	AP-10276	AP-10277	AP-10277
Location ID				BH0918	BH1006	BH1016	BH1106	BH11	BH1116	BH1206	BH1216	BH12	BH1306	BH1319	BH1406	BH1416	BH1505	BH1516	BH1605	BH1611	BH1705	BH1716
Laboratory				TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC
Lab Sample ID				48840-13	48809-10	48809-11	48840-15	48840-16	48840-17	48809-13	48809-14	48809-15	48809-17	48809-18	48809-2	48809-3	48809-6	48809-7	48971-2	48971-3	48971-5	48971-6
Collect Date				11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013
Matrix				SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO
Sample Type				Primary	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary
Analyte	Method	Units		Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier
Pentachlorophenol	SW8270D	µg/kg	47	ND [720]	ND [690]	ND [730]	ND [840]	ND [850]	ND [790]	ND [670]	ND [800]	ND [820]	ND [700]	ND [730]	ND [710]	ND [710]	ND [730]	ND [720]	ND [700]	ND [860]	ND [670]	ND [800]
Phenanthrene	SW8270D	µg/kg	3000000	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
Phenol	SW8270D	µg/kg	68000	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
Pyrene	SW8270D	µg/kg	1000000	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
bis(2-Chloroisopropyl)ether	SW8270D	µg/kg	NE	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
bis-(2-Chloroethoxy)methane	SW8270D	µg/kg	NE	ND [70]	ND [68]	ND [72]	ND [83]	ND [84]	ND [78]	ND [66]	ND [79]	ND [81]	ND [69]	ND [72]	ND [70]	ND [70]	ND [72]	ND [71]	ND [69]	ND [85]	ND [66]	ND [79]
bis-(2-Chloroethyl)ether	SW8270D	µg/kg	2.2	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
bis-(2-Ethylhexyl)phthalate	SW8270D	µg/kg	13000	ND [70]	ND [68]	ND [72]	ND [83]	ND [84]	ND [78]	ND [66]	ND [79]	ND [81]	ND [69]	ND [72]	ND [70]	ND [70]	ND [72]	ND [71]	ND [69]	ND [85]	ND [66]	ND [79]
n-Nitrosodi-n-propylamine	SW8270D	µg/kg	1.1	ND [70]	ND [68]	ND [72]	ND [83]	ND [84]	ND [78]	ND [66]	ND [79]	ND [81]	ND [69]	ND [72]	ND [70]	ND [70]	ND [72]	ND [71]	ND [69]	ND [85]	ND [66]	ND [79]
n-Nitrosodimethylamine	SW8270D	µg/kg	0.053	ND [70]	ND [68]	ND [72]	ND [83]	ND [84]	ND [78]	ND [66]	ND [79]	ND [81]	ND [69]	ND [72]	ND [70]	ND [70]	ND [72]	ND [71]	ND [69]	ND [85]	ND [66]	ND [79]
n-Nitrosodiphenylamine	SW8270D	µg/kg	15000	ND [35]	ND [34]	ND [36]	ND [41]	ND [42]	ND [39]	ND [33]	ND [39]	ND [40]	ND [35]	ND [36]	ND [35]	ND [35]	ND [36]	ND [35]	ND [35]	ND [42]	ND [33]	ND [40]
n-Nitrosopyrrolidine	SW8270D	µg/kg	NE	ND [140]	ND [130]	ND [140]	ND [160]	ND [160]	ND [150]	ND [130]	ND [160]	ND [160]	ND [140]	ND [140]	ND [140]	ND [140]	ND [140]	ND [140]	ND [140]	ND [170]	ND [130]	ND [160]
4,4'-DDD	SW8081B	µg/kg	7200	ND [0.76]	ND [0.70]	ND [0.73]	ND [0.85]	ND [0.81]	ND [0.83]	ND [0.66]	ND [0.83]	ND [0.82]	ND [0.67]	ND [0.77]	ND [0.69]	ND [0.74]	ND [0.78]	ND [0.70]	ND [0.71]	ND [0.88]	ND [0.66]	ND [0.85]
4,4'-DDE	SW8081B	µg/kg	5100	ND [0.50]	ND [0.47]	ND [0.49]	ND [0.57]	ND [0.54]	ND [0.55]	ND [0.44]	ND [0.55]	ND [0.55]	ND [0.44]	ND [0.52]	ND [0.46]	ND [0.50]	ND [0.52]	ND [0.46]	ND [0.47]	ND [0.59]	ND [0.44]	ND [0.56]
4,4'-DDT	SW8081B	µg/kg	7300	ND [0.76]	ND [0.70]	ND [0.73]	ND [0.85]	ND [0.81]	ND [0.83]	0.91 [0.66] J	ND [0.83]	ND [0.82]	ND [0.67]	ND [0.77]	ND [0.69]	ND [0.74]	ND [0.78]	ND [0.70]	ND [0.71]	1.9 [0.88] J	ND [0.66]	ND [0.85]
Aldrin	SW8081B	µg/kg	70	ND [0.50]	ND [0.47]	ND [0.49]	ND [0.57]	ND [0.54]	ND [0.55]	ND [0.44]	ND [0.55]	ND [0.55]	ND [0.44]	ND [0.52]	ND [0.46]	ND [0.50]	ND [0.52]	ND [0.46]	ND [0.47]	ND [0.59]	ND [0.44]	ND [0.56]
alpha-BHC	SW8081B	µg/kg	6.4	ND [0.50]	ND [0.47]	ND [0.49]	ND [0.57]	ND [0.54]	ND [0.55]	ND [0.44]	ND [0.55]	ND [0.55]	ND [0.44]	ND [0.52]	ND [0.46]	ND [0.50]	ND [0.52]	ND [0.46]	ND [0.47]	ND [0.59]	ND [0.44]	ND [0.56]
alpha-Chlordane	SW8081B	µg/kg	2300	ND [0.50]	ND [0.47]	ND [0.49]	ND [0.57]	ND [0.54]	ND [0.55]	ND [0.44]	ND [0.55]	ND [0.55]	ND [0.44]	ND [0.52]	ND [0.46]	ND [0.50]	ND [0.52]	ND [0.46]	ND [0.47]	ND [0.59]	ND [0.44]	ND [0.56]
beta-BHC	SW8081B	µg/kg	22	ND [0.76]	ND [0.70]	ND [0.73]	ND [0.85]	ND [0.81]	ND [0.83]	ND [0.66]	ND [0.83]	ND [0.82]	ND [0.67]	ND [0.77]	ND [0.69]	ND [0.74]	ND [0.78]	ND [0.70]	ND [0.47]	ND [0.59]	ND [0.44]	ND [0.56]
delta-BHC	SW8081B	µg/kg	NE	ND [0.76]	ND [0.70]	ND [0.73]	ND [0.85]	ND [0.81]	ND [0.83]	ND [0.66]	ND [0.83]	ND [0.82]	ND [0.67]	ND [0.77]	ND [0.69]	ND [0.74]	ND [0.78]	ND [0.70]	ND [0.47]	ND [0.59]	ND [0.44]	ND [0.56]
Dieldrin	SW8081B	µg/kg	7.6	ND [0.50]	ND [0.47]	ND [0.49]	ND [0.57]	ND [0.54]	ND [0.55]	ND [0.44]	ND [0.55]	ND [0.55]	ND [0.44]	ND [0.52]	ND [0.46]	ND [0.50]	ND [0.52]	ND [0.46]	ND [0.47]	ND [0.59]	ND [0.44]	ND [0.56]
Endosulfan I	SW8081B	µg/kg	64000	ND [0.50]	ND [0.47]	ND [0.49]	ND [0.57]	ND [0.54]	ND [0.55]	ND [0.44]	ND [0.55]	ND [0.55]	ND [0.44]	ND [0.52]	ND [0.46]	ND [0.50]	ND [0.52]	ND [0.46]	ND [0.47]	ND [0.59]	ND [0.44]	ND [0.56]
Endosulfan II	SW8081B	µg/kg	64000	ND [0.50]	ND [0.47]	ND [0.49]	ND [0.57]	ND [0.54]	ND [0.55]	ND [0.44]	ND [0.55]	ND [0.55]	ND [0.44]	ND [0.52]	ND [0.46]	ND [0.50]	ND [0.52]	ND [0.46]	ND [0.71]	ND [0.88]	ND [0.66]	ND [0.85]
Endosulfan sulfate	SW8081B	µg/kg	NE	ND [0.50]	ND [0.47]	ND [0.49]	ND [0.57]	ND [0.54]	ND [0.55]	ND [0.44]	ND [0.55]	ND [0.55]	ND [0.44]	ND [0.52]	ND [0.46]	ND [0.50]	ND [0.52]	ND [0.46]	ND [0.47]	ND [0.59]	ND [0.44]	ND [0.56]
Endrin	SW8081B	µg/kg	290	ND [0.50]	ND [0.47]	ND [0.49]	ND [0.57]	ND [0.54]	ND [0.55]	ND [0.44]	ND [0.55]	ND [0.55]	ND [0.44]	ND [0.52]	ND [0.46]	ND [0.50]	ND [0.52]	ND [0.46]	ND [0.71]	ND [0.88]	ND [0.66]	ND [0.85]
Endrin aldehyde	SW8081B	µg/kg	NE	ND [0.50]	ND [0.47]	ND [0.49]	ND [0.57]	ND [0.54]	ND [0.55]	ND [0.44]	ND [0.55]	ND [0.55]	ND [0.44]	ND [0.52]	ND [0.46]	ND [0.50]	ND [0.52]	ND [0.46]	ND [0.71]	ND [0.88]	ND [0.66]	ND [0.85]
Endrin ketone	SW8081B	µg/kg	NE	ND [0.76]	ND [0.70]	ND [0.73]	ND [0.85]	ND [0.81]	ND [0.83]	ND [0.66]	ND [0.83]	ND [0.82]	ND [0.67]	ND [0.77]	ND [0.69]	ND [0.74]	ND [0.78]	ND [0.70]	ND [28]	ND [35]	ND [26]	ND [33]
gamma-BHC (Lindane)	SW8081B	µg/kg	9.5	ND [0.76]	ND [0.70]	ND [0.73]	ND [0.85]	ND [0.81]	ND [0.83]	ND [0.66]	ND [0.83]	ND [0.82]	ND [0.67]	ND [0.77]	ND [0.69]	ND [0.74]	ND [0.78]	ND [0.70]	ND [0.47]	ND [0.59]	ND [0.44]	ND [0.56]
gamma-Chlordane	SW8081B	µg/kg	2300	ND [0.76]	ND [0.70]	ND [0.73]	ND [0.85]	ND [0.81]	ND [0.83]	ND [0.66]	ND [0.83]	ND [0.82]	ND [0.67]	ND [0.77]	ND [0.69]	ND [0.74]	ND [0.78]	ND [0.70]	ND [0.47]	ND [0.59]	ND [0.44]	ND [0.56]
Heptachlor	SW8081B	µg/kg	280	ND [0.50]	ND [0.47]	ND [0.49]	ND [0.57]	ND [0.54]	ND [0.55]	ND [0.44]	ND [0.55]	ND [0.55]	ND [0.44]	ND [0.52]	ND [0.46]	ND [0.50]	ND [0.52]	ND [0.46]	ND [0.71]	ND [0.88]	ND [0.66]	ND [0.85]
Heptachlor epoxide	SW8081B	µg/kg	14	ND [0.76]	ND [0.70]	ND [0.73]	ND [0.85]	ND [0.81]	ND [0.83]	ND [0.66]	ND [0.83]	ND [0.82]	ND [0.67]	ND [0.77]	ND [0.69]	ND [0.74]	ND [0.78]	ND [0.70]	ND [0.71]	ND [0.88]	ND [0.66]	ND [0.85]
Methoxychlor	SW8081B	µg/kg	23000	ND [0.76]	ND [0.70]	ND [0.73]	ND [0.85]	ND [0.81]	ND [0.83]	ND [0.66]	ND [0.83]	ND [0.82]	ND [0.67]	ND [0.77]	ND [0.69]	ND [0.74]	ND [0.78]	ND [0.70]	ND [0.71]	ND [0.88]	ND [0.66]	ND [0.85]
Toxaphene	SW8081B	µg/kg	3900	ND [30]	ND [28]	ND [29]	ND [33]	ND [32]	ND [32]	ND [26]	ND [32]	ND [32]	ND [26]	ND [30]	ND [27]	ND [29]	ND [31]	ND [27]	ND [0.71]	ND [0.88]	ND [0.66]	ND [0.85]
PCB-1016 (Aroclor 1016)	SW8082A	µg/kg	1000	ND [11]	ND [10]	ND [11]	ND [12]	ND [12]	ND [12]	ND [9.6]	ND [12]	ND [12]	ND [9.6]	ND [11]	ND [10]	ND [11]	ND [11]	ND [10]	ND [10]	ND [13]	ND [9.6]	ND [12]
PCB-1221 (Aroclor 1221)	SW8082A	µg/kg		ND [22]	ND [20]	ND [21]	ND [25]	ND [24]	ND [24]	ND [19]	ND [24]	ND [24]	ND [19]	ND [22]	ND [20]	ND [22]	ND [23]	ND [20]	ND [20]	ND [26]	ND [19]	ND [25]
PCB-1232 (Aroclor 1232)	SW8082A	µg/kg		ND [16]	ND [15]	ND [16]	ND [19]	ND [18]	ND [18]	ND [14]	ND [18]	ND [18]	ND [14]	ND [17]	ND [15]	ND [16]	ND [17]	ND [15]	ND [15]	ND [19]	ND [14]	ND [18]
PCB-1242 (Aroclor 1242)	SW8082A	µg/kg		ND [11]	ND [10]	ND [11]	ND [12]	ND [12]	ND [12]	ND [9.6]	ND [12]	ND [12]	ND [9.6]	ND [11]	ND [10]	ND [11]	ND [11]	ND [10]	ND [10]	ND [13]	ND [9.6]	ND [12]
PCB-1248 (Aroclor 1248)	SW8082A	µg/kg		ND [11]	ND [10]	ND [11]	ND [12]	ND [12]	ND [12]	ND [9.6]	ND [12]	ND [12]	ND [9.6]	ND [11]	ND [10]	ND [11]	ND [11]	ND [10]	ND [10]	ND [13]	ND [9.6]	ND [12]
PCB-1254 (Aroclor 1254)	SW8082A	µg/kg		ND [11]	ND [10]	ND [11]	ND [12]	ND [12]	ND [12]	ND [9.6]	ND [12]	ND [12]	ND [9.6]	ND [11]	ND [10]	ND [11]	ND [11]	ND [10]	ND [10]	ND [13]	ND [9.6]	ND [12]
PCB-1260 (Aroclor 1260)	SW8082A	µg/kg		ND [11]	ND [10]	ND [11]	ND [12]	ND [12]	ND [12]	ND [9.6]	ND [12]	ND [12]	ND [9.6]	ND [11]	ND [10]	ND [11]	ND [11]	ND [10]	ND [10]	ND [13]	ND [9.6]	ND [12]
Perfluorobutane Sulfonate (PFBS)	DVLC012	µg/kg	NE	ND [0.61]	0.89 [0.60]	ND [0.62]	65 [0.72]	54 [0.72]	0.33 [0.71] J	ND [0.58]	ND [0.76]	ND [0.72]	ND [0.60]	ND [0.65]	ND [0.60]	ND [0.64]	ND [0.66]	ND [0.61]	ND [0.63]	ND [0.73]	ND [0.59]	ND [0.74]
Perfluorobutyric acid (PFBTA)	DVLC012	µg/kg	NE	ND [0.61]	0.39 [0.60] J	ND [0.62]	10 [0.72]	11 [0.72]	ND [0.71]	0.79 [0.58]	ND [0.76]	ND [0.72]	ND [0.60]	ND [0.65]	ND [0.60]	ND [0.64]	ND [0.66]	ND [0.61]	ND [0.63]	ND [0.73]	ND [0.59]	ND [0.74]
Perfluorodecane Sulfonate (PFDCS)	DVLC012	µg/kg	NE	ND [0.61]	ND [0.60]	ND [0.62]	ND [0.72]	ND [0.72]	ND [0.71]	ND [0.58]	ND [0.76]	ND [0.72]	ND [0.60]	ND [0.65]	ND [0.60]	ND [0.64]	ND [0.66]	ND [0.61]	ND [0.63]	ND [0.73]	ND [0.59]	ND [0.74]
Perfluorododecanoic acid (PFDOA)	DVLC012	µg/kg	NE	ND [0.61]	ND [0.60]	ND [0.62]	ND [0.72]	ND [0.72]	ND [0.71]	1.3 [0.58] J	2.0 [0.76] J,Q	ND [0.72] Q	ND [0.60]	ND [0.65]	ND [0.60]	ND [0.64]	ND [0.66]	ND [0.61]	ND [0.63]	ND [0.73]	ND [0.59]	ND [0.74]
Perfluorohexanoic acid (PFHA)	DVLC012	µg/kg	NE	ND [0.61]	1.9 [0.60]	ND [0.62]	100 [0.72]	100 [0.72]	1.2 [0.71]	0.78 [0.58]	0.26 [0.76] J	0.18 [0.72] J	0.27 [0.60] J	ND [0.65]	0.15 [0.60] J	ND [0.64]	0.25 [0.66] J	ND [0.61]	0.47 [0.63] J	ND [0.73]	ND [0.59]	ND [0.74]
Perfluoroheptanoic acid (PFHPA)	DVLC012	µg/kg	NE	ND [0.61]	ND [0.60]	ND [0.62]	15 [0.72]	15 [0.72]	ND [0.71]	0.31 [0.58] J	ND [0.76]	ND [0.72]	ND [0.60]	ND [0.65]	ND [0.60]	ND [0.64]	ND [0.66]	ND [0.61]	ND [0.63]	ND [0.73]	ND [0.59]	ND [0.74]
Perfluorohexane Sulfonate (PFHXS)	DVLC012	µg/kg	NE	ND [0.61]	0.90 [0.60]	0.12 [0.62] J	160 [0.72]	130 [0.72]	3.5 [0.71]	7.8 [0.58]	ND [0.76]	ND [0.72]	0.94 [0.60]	ND [0.65]	ND [0.60]	ND [0.64]	3.5 [0.66]	ND [0.61]	1.3 [0.63]	ND [0.73]	ND [0.59]	1.0 [0.74]
Perfluorononanoic acid (PFNA)	DVLC012	µg/kg	NE	ND [0.61]	ND [0.60]	ND [0.62]	ND [0.72]	ND [0.72]	ND [0.71]	ND [0.58]	ND [0.76]	ND [0.72]	ND [0.60]	ND [0.65]	ND [0.60]	ND [0.64]	ND [0.66]	ND [0.61]	ND [0.63]	ND [0.73]	ND [0.59]	ND [0.74]
Perfluorodecanoic acid (PFNDCA)	DVLC012	µg/kg	NE	ND [0.61]	ND [0.60]	ND [0.62]	ND [0.72]	ND [0.72]	ND [0.71]	ND [0.58]	ND [0.76]	ND [0.72]	ND [0.60]	ND [0.65]	ND [0.60]	ND [0.64]	ND [0.66]	ND [0.61]	ND [0.63]	ND [0.73]	ND [0.59]	ND [0.74]
Perfluorooctanoic acid (PFOA)	DVLC012	µg/kg	142 / 2030 [2] (16000)[3]	ND [0.61]	0.25 [0.60] J	ND [0.62]	8.4 [0.72]	8.5 [0.72]	0.40 [0.71] J	0.48 [0.58] J	ND [0.76]	ND [0.72]	0.60 [0.60] J	ND [0.65]	ND [0.60]	ND [0.64]	0.64 [0.66] J	ND [0.61]	ND [0.63]	ND [0.73]	ND [0.59]	ND [0.74]
Perfluorooctane Sulfonate (PFOS)	DVLC012	µg/kg	571 / 3040 [2] (6000)[3]	ND [0.61]	0.43 [0.60] J	0.22 [0.62] J	150 [0.72]	190 [0.72]	16 [0.71]	2.1 [0.58]	0.60 [0.76] J	0.41 [0.72] J	22 [0.60]	ND [0.65]	ND [0.60]	ND [0.64]	ND [0.66]	ND [0.61]	ND [0.63]	ND [0.73]	ND [0.59]	0.24 [0.74] J
Perfluorooctane Sulfonamide (PFOSA)	DVLC012	µg/kg	NE	ND [0.61]	ND [0.60]	ND [0.62]	0.13 [0.72] J	0.15 [0.72] J	ND [0.71]	ND [0.58]	0.12 [0.76] J,Q	ND [0.72] Q	ND [0.60]	ND [0.65]	ND [0.60]	ND [0.64]	ND [0.66]	ND [0.61]	ND [0.63]	ND [0.73]	ND [0.59]	ND [0.74]
Perfluoropentanoic acid (PFPA)	DVLC012	µg/kg	NE	ND [0.61]	1.4 [0.60]	0.59 [0.62] J	41 [0.72]	41 [0.72]	0.69 [0.71] J	1.0 [0.58]	0.37 [0.76] J	0.48 [0.72] J	ND [0.60]	ND [0.65]	ND [0.60]	ND [0.64]	0.29 [0.66] J	ND [0.61]	ND [0.63]	ND [0.73]	0.37 [0.59] J	ND [0.74]
Perfluorotetradecanoic acid (PFTEDA)	DVLC012	µg/kg	NE	ND [0.61]	ND [0.60]	ND [0.62]	ND [0.72]	ND [0.72]	ND [0.71]	ND [0.58]	ND [0.76]	ND [0.72]	ND [0.60]	ND [0.65]	ND [0.60]	ND [0.64]	ND [0.66]	ND [0.61]	ND [0.63]	ND [0.73]	ND [0.59]	ND [0.74]
Perfluorotridecanoic acid (PFTRIDA)	DVLC012	µg/kg	NE	ND [0.61]	ND [0.60]	ND [0.62]	ND [0.72]	ND [0.72]	ND [0.71]	ND [0.58]	ND [0.76]	ND [0.72]	ND [0.60]	ND [0.65]	ND [0.60]	ND [0.64]	ND [0.66]	ND [0.61]	ND [0.63]	ND [0.73]	ND [0.59]	ND [0.74]
Perfluoroundecanoic acid (PFUNDCA)	DVLC012	µg/kg	NE	ND [0.61]	ND [0.60]	ND [0.62]	ND [0.72]	ND [0.72]	ND [0.71]	ND [0.58]	ND [0.76]	ND [0.72]	ND [0.60]	ND [0.65]	ND [0.60]	ND [0.64]	ND [0.66]	ND [0.61]	ND [0.63]	ND [0.73]	ND [0.59]	ND [0.74]
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpC	SW8290A	pg/g	NE	ND [0.059]	0.45[0.044] J,B	0.098[0.026] J,B	0.11 [0.037] J,B	0.067[0.046] J,B	ND [0.038]	ND [0.084]	ND [0.12]	ND [0.13]	0.23 [0.085] J	ND [0.11]	0.12 [0.033] J	0.13 [0.050] J	ND [0.060]	0.10 [0.042] J	ND [0.045]	ND [0.16]	0.084 [0.067] J	ND [0.054]
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxins-C13	SW8290A	pg/g	NE	62 [0]	76 [0]	66 [0]	71 [0]	66 [0]	67 [0]	62 [0]	62 [0]	53 [0]	64 [0]	54 [0]	73 [0]	64 [0]	75 [0]	62 [0]	72 [0]	60 [0]	58 [0]	70 [0]
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF	SW8290A	pg/g	NE	0.25[0.029] J,B	17 [0.24]	2.1 [0.054] J,B	0.53[0.025] J,B,Q	4.0 [0.073] J,B,Q	0.98[0.051] J,B	1.1 [0.16] J,B	4.9 [0.30] J,B	3.8 [0.21] J,B	0.76 [0.15] J,B	2.5[0.18] J,B	1.7[0.071] J,B	0.51[0.056] J,B	0.46[0.051] J,B	0.55[0.060] J,B	0.61[0.046] J,B	0.56[0.090] J	0.23 [0.067] J	0.29 [0.038] J
1,2,3,4,6,7,8-Heptachlorodibenzofurans-C13	SW8290A	pg/g	NE	67 [0]	85 [0]	71 [0]	75 [0]	72 [0]	73 [0]	65 [0]	70 [0]	65 [0]	71 [0]	61 [0]	71 [0]	63 [0]	73 [0]	56 [0]	66 [0]	49 [0]	50 [0]	64 [0]
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF	SW8290A	pg/g	NE	ND [0.034]	1.0 [0.28] J	ND [0.064]	ND [0.029]	ND [0.085]	ND [0.060]	ND [0.19]	ND [0.35]	ND [0.25]	ND [0.18]	ND [0.21]	ND [0.085]	ND [0.067]	ND [0.061]	ND [0.071]	ND [0.055]	ND [0.11]	ND [0.080]	ND [0.045]
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD	SW8290A	pg/g	NE	ND [0.034]	ND [0.025]	ND [0.036]	ND [0.024]	ND [0.033]	ND [0.030]	ND [0.077]	ND [0.12]	ND [0.11]	ND [0.087]	ND [0.13]	ND [0.062]	ND [0.078]	ND [0.067]	ND [0.085]	ND [0.052]	ND [0.10]	ND [0.058]	ND [0.060]
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	SW8290A	pg/g	NE	0.086[0.026] J,B	1.4[0.038] J,B	0.37 [0.042] J,B	0.18[0.021] J,B,Q	1.7 [0.047] J,B,Q	0.38[0.025] J,B	0.22 [0.15] J	0.96 [0.22] J	0.68 [0.18] J	0.39 [0.13] J	ND [0.17]	0.63 [0.095] J	ND [0.11]	ND [0.093]	ND [0.12]	ND [0.061]	0.24 [0.071] J	ND [0.043]	0.10 [0.039] J
1,2,3,4,7,8-Hexachlorodibenzofuran-C13	SW8290A	pg/g	NE	66 [0]	84 [0]	76 [0]	72 [0]	73 [0]	76 [0]	71 [0]	69 [0]	67 [0]	75 [0]	64 [0]	66 [0]	59 [0]	68 [0]	52 [0]	59 [0]	47 [0]	49 [0]	63 [0]

Table A-4 Subsurface Soil Sample Results
Fire Training Pits Investigation
Fort Wainwright, Alaska

			ADEC Cleanup Level/ [1,2] EPA Screening Level[3]	13FWFP20SO	13FWFP21SO	13FWFP22S0	13FWFP23SO	13FWFP24SO	13FWFP25SO	13FWFP26SO	13FWFP27SO	13FWFP28SO
		Boring ID		AP-10269	AP-10270	AP-10270	AP-10271	AP-10271	AP-10271	AP-10272	AP-10272	AP-10272
		Location ID		BH0918	BH1006	BH1016	BH1106	BH11	BH1116	BH1206	BH1216	BH12
		Laboratory		TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC
		Lab Sample ID		48840-13	48809-10	48809-11	48840-15	48840-16	48840-17	48809-13	48809-14	48809-15
		Collect Date		11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013	11/01/2013
		Matrix		SO	SO	SO	SO	SO	SO	SO	SO	SO
		Sample Type		Primary	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary	Field Duplicate
Analyte	**Method**	**Units**		**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD	SW8290A	pg/g	NE	ND [0.027]	ND [0.020]	ND [0.029]	ND [0.019]	ND [0.031]	ND [0.024]	ND [0.056]	ND [0.091]	ND [0.080]
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin-C13	SW8290A	pg/g	NE	76 [0]	95 [0]	81 [0]	83 [0]	85 [0]	86 [0]	75 [0]	79 [0]	72 [0]
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	SW8290A	pg/g	NE	ND [0.022]	0.14[0.033] J,B	0.13 [0.036] J,B	0.041[0.018]J,B,Q	0.21[0.041]J,B,Q	0.062[0.022] J,B	ND [0.11]	0.39[0.17] J,Q	ND [0.14] Q
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD	SW8290A	pg/g	NE	ND [0.027]	ND [0.020]	ND [0.029]	ND [0.019]	ND [0.027]	ND [0.024]	ND [0.054]	ND [0.088]	ND [0.077]
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	SW8290A	pg/g	NE	ND [0.027]	ND [0.040]	ND [0.044]	ND [0.022]	ND [0.049]	ND [0.027]	ND [0.14]	ND [0.21]	ND [0.18]
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	SW8290A	pg/g	NE	ND [0.070]	ND [0.053]	ND [0.063]	ND [0.044]	ND [0.071]	ND [0.052]	ND [0.13]	ND [0.13]	ND [0.13]
1,2,3,7,8-Pentachlorodibenzo-p-dioxin-C13	SW8290A	pg/g	NE	58 [0]	73 [0]	62 [0]	73 [0]	64 [0]	68 [0]	57 [0]	60 [0]	53 [0]
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	SW8290A	pg/g	NE	ND [0.057]	ND [0.035]	ND [0.049]	ND [0.033]	ND [0.059]	ND [0.042]	ND [0.11]	ND [0.16]	ND [0.15]
1,2,3,7,8-Pentachlorodibenzofurans-C13	SW8290A	pg/g	NE	61 [0]	78 [0]	67 [0]	80 [0]	66 [0]	70 [0]	60 [0]	61 [0]	59 [0]
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	SW8290A	pg/g	NE	ND [0.024]	0.089[0.036] J	ND [0.039]	ND [0.020]	ND [0.044]	ND [0.024]	ND [0.13]	ND [0.19]	ND [0.16]
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	SW8290A	pg/g	NE	ND [0.059]	ND [0.037]	ND [0.051]	ND [0.034]	ND [0.062]	ND [0.043]	ND [0.12]	ND [0.17]	ND [0.15]
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	SW8290A	pg/g	47	ND [0.035]	ND [0.030]	ND [0.059]	ND [0.027]	ND [0.058]	ND [0.033]	ND [0.078]	ND [0.11]	ND [0.086]
2,3,7,8-Tetrachlorodibenzo-p-dioxin-C13	SW8290A	pg/g	NE	63 [0]	79 [0]	68 [0]	75 [0]	68 [0]	73 [0]	63 [0]	61 [0]	60 [0]
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	SW8290A	pg/g	NE	ND [0.029]	ND [0.21]	ND [0.029]	ND [0.026]	ND [0.26]	ND [0.026]	ND [0.071]	ND [0.10]	ND [0.083]
2,3,7,8-Tetrachlorodibenzofuran-C13	SW8290A	pg/g	NE	65 [0]	75 [0]	74 [0]	77 [0]	65 [0]	77 [0]	63 [0]	62 [0]	60 [0]
Octachlorodibenzo-p-dioxin (OCDD)	SW8290A	pg/g	NE	0.31 [0.060] J,B	8.7 [0.091] J,B	0.60 [0.048] J,B	0.43[0.036] J,B	0.38 [0.047] J,B	0.46[0.043] J,B	1.0 [0.098] J	1.1[0.17] J,Q	0.61 [0.12] J,Q
Octachlorodibenzo-p-dioxin-C13	SW8290A	pg/g	NE	59 [0]	78 [0]	64 [0]	73 [0]	63 [0]	64 [0]	54 [0]	53 [0]	49 [0]
Octachlorodibenzofuran (OCDF)	SW8290A	pg/g	NE	0.18[0.080] J,B	230 [2.1]	7.8 [0.10] J,B	0.59 [0.050] J,B,Q	1.2[0.077] J,B,Q	3.1[0.13] J,B	1.2 [0.25] J	17 [0.45] Q	9.3 [0.37] J,Q
Total Heptachlorodibenzo-p-dioxins (HpCDD)	SW8290A	pg/g	NE	ND [0.059]	0.82[0.044] J,B	0.27[0.026] J,B	0.23 [0.037] J,B	0.18 [0.046] J,B	0.11[0.038] J,B	0.15 [0.084] J	ND [0.12]	ND [0.13]
Total Heptachlorodibenzofurans (HpCDF)	SW8290A	pg/g	NE	0.25[0.032] J,B	21 [0.26]	2.5 [0.059] J,B	0.63 [0.027] J,B,Q	4.0[0.079] J,B,Q	1.1[0.055] J,B	1.1 [0.18] J,B	6.3 [0.32] B	3.8 [0.23] J,B
Total Hexachlorodibenzo-p-dioxins (HxCDD)	SW8290A	pg/g	NE	ND [0.034]	ND [0.065]	ND [0.036]	ND [0.024]	ND [0.051]	ND [0.12]	ND [0.077]	ND [0.12]	ND [0.11]
Total Hexachlorodibenzofurans (HxCDF)	SW8290A	pg/g	NE	0.086[0.025]J,B	2.1[0.037] J,B	0.65 [0.040] J,B	0.30 [0.020] J,B,Q	3.3[0.045] J,B,Q	0.67[0.025] J,B	0.22 [0.13] J	1.4[0.20] J,Q	0.68 [0.16] J,Q
Total Pentachlorodibenzo-p-dioxin (PeCDD)	SW8290A	pg/g	NE	ND [0.070]	ND [0.053]	ND [0.063]	ND [0.044]	ND [0.071]	ND [0.052]	ND [0.13]	ND [0.13]	ND [0.13]
Total Pentachlorodibenzofurans (PeCDF)	SW8290A	pg/g	NE	ND [0.059]	0.19 [0.036] J,B	0.087[0.050] J,B	ND [0.034] Q	1.1[0.061] J,B,Q	0.10 [0.042] J,B	ND [0.12]	ND [0.17]	ND [0.15]
Total Tetrachlorodibenzo-p-dioxins (TCDD)	SW8290A	pg/g	NE	0.17[0.035] J,B	ND [0.030]	ND [0.059]	ND [0.027]	ND [0.075]	ND [0.033]	ND [0.078]	ND [0.11]	ND [0.086]
Total Tetrachlorodibenzofurans (TCDF)	SW8290A	pg/g	NE	ND [0.029]	0.088[0.025]J,B	0.16 [0.029] J,B	ND [0.034] Q	0.27[0.041] J,B,Q	ND [0.026]	ND [0.071]	ND [0.10]	ND [0.083]
Total Dioxin/Furan TEQ	SW8290A	pg/g	47 [4,5]	0.011	0.42	0.074	0.029	0.23	0.055	0.034	0.19	0.11

			ADEC Cleanup Level/ [1,2] EPA Screening Level[3]	13FWFP29SO	13FWFP30SO	13FWFP31SO	13FWFP32SO	13FWFP33SO	13FWFP34SO	13FWFP35SO	13FWFP36SO	13FWFP37SO	13FWFP38SO
		Boring ID		AP-10273	AP-10273	AP-10274	AP-10274	AP-10275	AP-10275	AP-10276	AP-10276	AP-10277	AP-10277
		Location ID		BH1306	BH1319	BH1406	BH1416	BH1505	BH1516	BH1605	BH1611	BH1705	BH1716
		Laboratory		TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC
		Lab Sample ID		48809-17	48809-18	48809-2	48809-3	48809-6	48809-7	48971-2	48971-3	48971-5	48971-6
		Collect Date		11/01/2013	11/01/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013
		Matrix		SO	SO	SO	SO	SO	SO	SO	SO	SO	SO
		Sample Type		Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary
Analyte	**Method**	**Units**		**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD	SW8290A	pg/g	NE	ND [0.064]	ND [0.092]	ND [0.065]	ND [0.082]	ND [0.070]	ND [0.090]	ND [0.055]	ND [0.080]	ND [0.047]	ND [0.048]
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin-C13	SW8290A	pg/g	NE	85 [0]	68 [0]	96 [0]	78 [0]	89 [0]	65 [0]	75 [0]	61 [0]	68 [0]	78 [0]
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	SW8290A	pg/g	NE	ND [0.10]	ND [0.13]	ND [0.092]	ND [0.11]	ND [0.090]	ND [0.12]	ND [0.059]	ND [0.059]	ND [0.036]	ND [0.032]
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD	SW8290A	pg/g	NE	ND [0.061]	ND [0.088]	ND [0.054]	ND [0.068]	ND [0.058]	ND [0.074]	ND [0.045]	ND [0.078]	ND [0.045]	ND [0.047]
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	SW8290A	pg/g	NE	ND [0.13]	ND [0.17]	ND [0.10]	ND [0.12]	ND [0.098]	ND [0.13]	ND [0.064]	ND [0.074]	ND [0.045]	ND [0.041]
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	SW8290A	pg/g	NE	ND [0.14]	ND [0.10]	ND [0.14]	ND [0.21]	ND [0.15]	ND [0.17]	ND [0.17]	ND [0.13]	ND [0.11]	ND [0.11]
1,2,3,7,8-Pentachlorodibenzo-p-dioxin-C13	SW8290A	pg/g	NE	61 [0]	51 [0]	69 [0]	58 [0]	68 [0]	55 [0]	55 [0]	72 [0]	69 [0]	78 [0]
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	SW8290A	pg/g	NE	ND [0.11]	ND [0.14]	ND [0.27]	ND [0.34]	ND [0.35]	ND [0.35]	ND [0.29]	ND [0.093]	ND [0.085]	ND [0.052]
1,2,3,7,8-Pentachlorodibenzofurans-C13	SW8290A	pg/g	NE	65 [0]	52 [0]	63 [0]	51 [0]	57 [0]	46 [0]	46 [0]	65 [0]	62 [0]	71 [0]
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	SW8290A	pg/g	NE	ND [0.11]	ND [0.15]	ND [0.095]	ND [0.11]	ND [0.093]	ND [0.12]	ND [0.061]	ND [0.066]	ND [0.040]	ND [0.036]
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	SW8290A	pg/g	NE	ND [0.11]	ND [0.14]	ND [0.28]	ND [0.35]	ND [0.37]	ND [0.36]	ND [0.30]	ND [0.098]	ND [0.090]	ND [0.054]
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	SW8290A	pg/g	47	ND [0.084]	ND [0.10]	ND [0.071]	ND [0.079]	ND [0.078]	ND [0.091]	ND [0.083]	ND [0.095]	ND [0.052]	ND [0.066]
2,3,7,8-Tetrachlorodibenzo-p-dioxin-C13	SW8290A	pg/g	NE	67 [0]	58 [0]	75 [0]	63 [0]	71 [0]	58 [0]	60 [0]	71 [0]	69 [0]	78 [0]
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	SW8290A	pg/g	NE	ND [0.069]	ND [0.083]	ND [0.12]	ND [0.15]	ND [0.082]	ND [0.14]	ND [0.11]	ND [0.083]	ND [0.058]	ND [0.059]
2,3,7,8-Tetrachlorodibenzofuran-C13	SW8290A	pg/g	NE	68 [0]	56 [0]	69 [0]	60 [0]	65 [0]	53 [0]	53 [0]	67 [0]	67 [0]	74 [0]
Octachlorodibenzo-p-dioxin (OCDD)	SW8290A	pg/g	NE	3.1 [0.11] J	ND [0.13]	0.56 [0.086] J	1.3 [0.079] J	0.80 [0.11] J	0.47 [0.069] J	0.30 [0.053] J	0.95[0.092] J	0.60 [0.093] J	0.23 [0.082] J
Octachlorodibenzo-p-dioxin-C13	SW8290A	pg/g	NE	46 [0]	40 [0]	64 [0]	57 [0]	64 [0]	56 [0]	66 [0]	56 [0]	51 [0]	57 [0]
Octachlorodibenzofuran (OCDF)	SW8290A	pg/g	NE	0.74 [0.22] J	1.1 [0.32] J	0.79 [0.064] J	0.32 [0.074] J	0.80[0.082] J	0.60 [0.069] J	0.39 [0.055] J	ND [0.16]	ND [0.072]	0.36[0.074]J,B
Total Heptachlorodibenzo-p-dioxins (HpCDD)	SW8290A	pg/g	NE	0.23 [0.085] J	ND [0.11]	0.32 [0.033] J	0.45 [0.050] J	0.23 [0.060] J	0.27[0.042] J	0.12 [0.045] J	ND [0.18]	0.20[0.067] J,B	ND [0.054]
Total Heptachlorodibenzofurans (HpCDF)	SW8290A	pg/g	NE	0.76[0.17] J,B	2.5[0.20] J,B	1.7[0.078] J,B	0.51[0.062]J,B	0.46[0.056]J,B	0.55[0.066] J,B	0.61[0.051]J,B	0.56[0.099] J	0.23 [0.073] J	0.29 [0.041] J
Total Hexachlorodibenzo-p-dioxins (HxCDD)	SW8290A	pg/g	NE	ND [0.087]	ND [0.13]	ND [0.25]	ND [0.12]	ND [0.33]	ND [0.090]	ND [0.12]	ND [0.10]	ND [0.058]	ND [0.060]
Total Hexachlorodibenzofurans (HxCDF)	SW8290A	pg/g	NE	0.39 [0.12] J	ND [0.17]	0.63 [0.095] J	ND [0.12]	ND [0.098]	ND [0.13]	ND [0.064]	0.24[0.067] J	ND [0.045]	0.10 [0.037] J
Total Pentachlorodibenzo-p-dioxin (PeCDD)	SW8290A	pg/g	NE	ND [0.14]	ND [0.10]	0.32 [0.14] J	ND [0.21]	ND [0.15]	ND [0.17]	ND [0.17]	ND [0.13]	ND [0.11]	ND [0.11]
Total Pentachlorodibenzofurans (PeCDF)	SW8290A	pg/g	NE	ND [0.11]	ND [0.14]	ND [0.28]	ND [0.35]	ND [0.37]	ND [0.36]	ND [0.30]	ND [0.098]	ND [0.090]	ND [0.054]
Total Tetrachlorodibenzo-p-dioxins (TCDD)	SW8290A	pg/g	NE	ND [0.084]	ND [0.11]	0.40 [0.071] J	ND [0.17]	ND [0.15]	0.39[0.091] J	ND [0.17]	ND [0.095]	ND [0.052]	ND [0.066]
Total Tetrachlorodibenzofurans (TCDF)	SW8290A	pg/g	NE	ND [0.069]	ND [0.083]	ND [0.12]	ND [0.15]	ND [0.082]	ND [0.14]	ND [0.11]	ND [0.083]	ND [0.058]	ND [0.059]
Total Dioxin/Furan TEQ	SW8290A	pg/g	47 [4,5]	0.05	0.025	0.082	0.0069	0.0051	0.0068	0.0063	0.03	0.0033	0.013

Yellow highlighted and **bolded** results exceed ADEC soil cleanup levels (most stringent pathway).
Green highlighted results exceed ADEC's proposed migration to groundwater cleanup level (applies to PFOA or PFOS only).
Grey highlighted results are non-detect with LODs above cleanup levels.

[1] Cleanup levels are from ADEC Title 18, Alaska Administrative Code, Section 75.341, Tables B1 and B2 (ADEC, 2012).

[2] Proposed cleanup levels for PFOA and PFOS (migration to groundwater / human health) are from the Public Comment Draft of 18 AAC 75 dated August 26, 2015.

[3] EPA Region 4 Residential Soil Screening Levels from "Soil Screening Levels for Perfluorooctanoic Acid (PFOA) and Perfluorooctyl Sulfonate (PFOS)"

[4] Total TEQs are presented for each sample (none of which exceed the ADEC cleanup level). Analyte-specific TEQs are presented in the associated laboratory reports. Total TEQ = $\Sigma(C_i * TEF_i)$

[5] TEFs (used to calculate TEQs) are established from the World Health Organization (WHO, 2005).

LOD - limit of detection
LOQ - limit of quantitation
µg/kg - micrograms per kilogram
mg/kg - milligrams per kilogram
NA - not applicable
NE - not established
PFC - perfluorinated compounds
pg/g - picograms per gram
QC - quality control
SO - subsurface soil matrix
SQ - soil QC
TADC - TestAmerica Laboratories of Denver, CO
TEF - toxicity equivalency factor
TEQ - toxicity equivalence, where Total TEQ = $\Sigma(C_i * TEF_i)$

Data Qualifiers:
B - result may be due to cross-contamination
J - result qualified as estimate because it is less than the LOQ
M - result considered an estimate (L - low; H - high) due to matrix interference
ND - non-detect (LOD in parentheses)
Q - result considered an estimate (L - low; H - high) due to a QC failure
R - result rejected due to QC issue

Table A-4 Subsurface Soil Sample Results
Fire Training Pits Investigation
Fort Wainwright, Alaska

Sample ID			ADEC Cleanup Level/ [1,2] EPA Screening Level[3]	13FWFP39SO	13FWFP40SO	13FWFP41SO	13FWFP42SO	13FWFP43SO	13FWFP44SO	13FWFP45SO	13FWFP46SO	13FWFP47SO	13FWFP48SO	13FWFP49SO	13FWFP50SO	13FWFP51SO	13FWFP52SO	13FWFP53SO	13FWFP54SO	13FWFP55SO	13FWFP56SO
Boring ID				AP-10278	AP-10278	AP-10279	AP-10279	AP-10280	AP-10280	AP-10280	AP-10281	AP-10281	AP-10282	AP-10282	AP-10282	AP-10283	AP-10283	AP-10283	AP-10284	AP-10284	AP-10285
Location ID				BH1805	BH1812	BH1906	BH1915	BH2005	BH2016	BH20	BH2105	BH2117	BH2206	BH22	BH2216	BH2306	BH2315	BH23	BH2406	BH2415	BH2506
Laboratory				TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC
Lab Sample ID				48971-8	48971-9	48971-12	48971-13	48971-15	48971-16	48971-17	48964-2	48964-3	48964-5	48964-6	48964-7	48964-9	48964-10	48964-11	48964-13	48964-14	48964-16
Collect Date				11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013
Matrix				SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO
Sample Type				Primary	Primary	Primary	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary
Analyte	**Method**	**Units**		**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**
Gasoline Range Organics (C6-C10)	AK101	mg/kg	300	6.20[0.39]B	1.60 [0.48] B,QL	0.53 [0.37] J,B	0.52 [0.47] J,B	4.20[0.39] B	0.48 [0.48] J.B	0.34 [0.46] J,B	2.20[0.40] B,ML	0.47 [0.40] J,B	0.58 [0.38] B	0.44 [0.38] J,B	0.30[0.67] J,B,QL	1.10 [0.34] B	0.39[0.69] J,B,QL	0.32[0.69] J,B,QL	2.60 [0.60] B	0.35[0.67] J,B,QL	0.29[0.45] J,B
Diesel Range Organics (C10-C25)	AK102	mg/kg	250	1.4 [2.0] J	1.2 [2.2] J	1.1 [1.9] J,QL	1.1 [2.0] J	1.4 [2.0] J	1.3 [2.1] J,QL	1.4 [2.1] J	ND [2.0]	ND [2.1]	2.6 [2.0] J	2.0 [1.9] J	ND [2.5]	ND [1.9]	ND [2.4]	ND [2.4]	1.7 [2.0] J	ND [2.5]	1.1 [2.2] J
Residual Range Organics (C25-C36)	AK103	mg/kg	11000	ND [10]	ND [11]	ND [9.4]	ND [10]	ND [10]	ND [10]	ND [11]	ND [10]	ND [10]	ND [10]	ND [9.6]	ND [13]	ND [9.7]	ND [12]	ND [12]	7.6 [9.8] J	ND [13]	ND [11]
Arsenic	SW6020A	µg/kg	3900	3200 [140]	1500 [160]	3400 [150]	2200 [150]	5100 [130]	3000 [150]	3500 [160]	7100 [140]	4900 [160]	3900 [140]	3800 [150]	2600 [160]	3900 [150]	6100 [160]	4600 [170]	11000 [140]	6300 [160]	7700 [150]
Barium	SW6020A	µg/kg	1100000	63000 [190]	55000 [210]	50000 [200]	40000 [210]	68000 [180]	44000 [200]	33000 [210]	73000 [190] J	33000 [210]	52000 [180]	47000 [190]	57000 [220]	55000 [200]	62000 [220]	62000 [230]	92000 [180]	64000 [220]	94000 [210]
Cadmium	SW6020A	µg/kg	5000	71 [24] J	41 [26] J	51 [25] J	37 [26] J	94 [22]	69 [25] J	54 [26] J	120 [24] J,ML	25 [26] J	54 [23] J	70 [24] J	80 [27] J	62 [26] J	55 [27] J	47 [29] J	120 [23]	55 [27] J	150 [26]
Chromium	SW6020A	µg/kg	25000	12000 [170]	6000 [180]	9000 [180]	6300 [180]	13000 [160]	9000 [180]	8800 [190]	13000 [170]	8300 [180]	8800 [160]	8700 [170]	9900 [190]	11000 [180]	10000 [190]	9900 [200]	17000 [160]	11000 [190]	15000 [180]
Lead	SW6020A	µg/kg	400000	3700 [48]	2200 [52]	5000 [50]	2600 [51]	3900 [45]	2800 [51]	3500 [53]	4700 [47]	2500 [53]	3100 [46]	3000 [49]	3100 [55]	2900 [51]	3400 [55]	3200 [57]	5900 [46]	3600 [54]	4800 [51]
Selenium	SW6020A	µg/kg	3400	ND [240]	ND [260]	ND [250]	ND [260]	ND [220]	ND [250]	ND [260]	170 [240] J	ND [260]	ND [230]	ND [240]	ND [270]	ND [260]	ND [270]	ND [290]	250 [230] J	ND [270]	140 [260] J
Silver	SW6020A	µg/kg	11200	23 [58] J	27 [63] J	35 [60] J	26 [62] J	28 [54] J	28 [61] J,Q	ND [64] Q	39 [57] J	ND [63]	23 [55] J	28 [58] J	23 [66] J	24 [61] J	26 [66] J	27 [69] J	54 [55] J	32 [65] J	52 [62] J
Mercury	SW7471B	µg/kg	1400	6.6 [15] J	ND [15]	ND [15]	ND [16]	ND [15]	ND [16]	ND [16]	6.4 [15] J	73 [14]	ND [14]	11 [15] J	ND [20]	9.9 [16] J	ND [20]	ND [20]	13 [15] J	9.8 [18] J	25 [17]
1,1,1,2-Tetrachloroethane	SW8260B	µg/kg	NE	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9]	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
1,1,1-Trichloroethane	SW8260B	µg/kg	820	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9] ML	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
1,1,2,2-Tetrachloroethane	SW8260B	µg/kg	17	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9]	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
1,1,2-Trichloroethane	SW8260B	µg/kg	18	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9]	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
1,1-Dichloroethane	SW8260B	µg/kg	25000	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9] ML	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
1,1-Dichloroethene	SW8260B	µg/kg	30	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9] ML	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
1,1-Dichloropropene	SW8260B	µg/kg	NE	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9] ML	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
1,2,3-Trichlorobenzene	SW8260B	µg/kg	NE	ND [14]	ND [18]	ND [14]	ND [17]	ND [14]	ND [18]	ND [17]	ND [15]	ND [15]	ND [14]	ND [14]	ND [25]	ND [13]	ND [26]	ND [26]	ND [22]	ND [25]	ND [17]
1,2,3-Trichloropropane	SW8260B	µg/kg	0.53	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9]	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
1,2,4-Trichlorobenzene	SW8260B	µg/kg	850	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9]	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
1,2,4-Trimethylbenzene	SW8260B	µg/kg	23000	ND [9.6]	ND [12]	ND [9.2]	2.6 [12] J,B	ND [9.6]	ND [12]	ND [11]	1.8 [9.9] J,B	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
1,2-Dibromo-3-chloropropane	SW8260B	µg/kg	NE	ND [48]	ND [59]	ND [46]	ND [58]	ND [48]	ND [59]	ND [56]	ND [50]	ND [49]	ND [47]	ND [47]	ND [84]	ND [42]	ND [87]	ND [87]	ND [74]	ND [84]	ND [56]
1,2-Dibromoethane	SW8260B	µg/kg	0.16	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9] ML	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
1,2-Dichlorobenzene	SW8260B	µg/kg	5100	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9]	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
1,2-Dichloroethane	SW8260B	µg/kg	16	ND [7.7]	ND [9.5]	ND [7.3]	ND [9.2]	ND [7.7]	ND [9.4]	ND [9.0]	ND [7.9] ML	ND [7.8]	ND [7.5]	ND [7.5]	ND [13]	ND [6.8]	ND [14]	ND [14]	ND [12]	ND [14]	ND [9.0]
1,2-Dichloroethene, Total	SW8260B	µg/kg	NE	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9]	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
1,2-Dichloropropane	SW8260B	µg/kg	18	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9] ML	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
1,3,5-Trimethylbenzene	SW8260B	µg/kg	23000	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9]	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
1,3-Dichlorobenzene	SW8260B	µg/kg	28000	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9]	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
1,3-Dichloropropane	SW8260B	µg/kg	33	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9]	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
1,4-Dichlorobenzene	SW8260B	µg/kg	640	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9]	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
2,2-Dichloropropane	SW8260B	µg/kg	NE	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9] ML	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
2-Butanone	SW8260B	µg/kg	59000	ND [38]	ND [48]	ND [37]	ND [46]	ND [38]	ND [47]	ND [45]	ND [40]	ND [39]	ND [38]	ND [38]	ND [67]	ND [34]	ND [69]	ND [70]	ND [59]	ND [68]	ND [45]
2-Chlorotoluene	SW8260B	µg/kg	NE	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9]	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
2-Hexanone	SW8260B	µg/kg	NE	ND [38]	ND [48]	ND [37]	ND [46]	ND [38]	ND [47]	ND [45]	ND [40] R	ND [39]	ND [38]	ND [38]	ND [67]	ND [34]	ND [69]	ND [70]	ND [59]	ND [68]	ND [45]
4-Chlorotoluene	SW8260B	µg/kg	NE	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9]	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
4-Isopropyltoluene	SW8260B	µg/kg	NE	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9]	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
4-Methyl-2-pentanone	SW8260B	µg/kg	8100	ND [38]	ND [48]	ND [37]	ND [46]	ND [38]	ND [47]	ND [45]	ND [40] R	ND [39]	ND [38]	ND [38]	ND [67]	ND [34]	ND [69]	ND [70]	ND [59]	ND [68]	ND [45]
Acetone	SW8260B	µg/kg	88000	ND [96]	ND [120]	ND [92]	ND [120]	ND [96]	ND [120]	ND [110]	ND [99]	ND [98]	ND [94]	ND [94]	ND [170]	ND [85]	ND [170]	ND [170]	ND [150]	ND [170]	ND [110]
Benzene	SW8260B	µg/kg	25	ND [3.8]	ND [4.8]	ND [3.7]	ND [4.6]	ND [3.8]	ND [4.7]	ND [4.5]	ND [4.0] ML	ND [3.9]	ND [3.8]	ND [3.8]	ND [6.7]	ND [3.4]	ND [6.9]	ND [7.0]	ND [5.9]	ND [6.8]	ND [4.5]
Bromobenzene	SW8260B	µg/kg	NE	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9]	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
Bromochloromethane	SW8260B	µg/kg	NE	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9] ML	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
Bromodichloromethane	SW8260B	µg/kg	44	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9]	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
Bromoform	SW8260B	µg/kg	340	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9]	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
Bromomethane	SW8260B	µg/kg	160	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9] R	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
Carbon disulfide	SW8260B	µg/kg	12000	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9] R	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
Carbon tetrachloride	SW8260B	µg/kg	23	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9] ML	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
Chlorobenzene	SW8260B	µg/kg	630	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9] ML	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
Chloroethane	SW8260B	µg/kg	580000	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9] ML	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
Chloroform	SW8260B	µg/kg	460	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9] ML	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
Chloromethane	SW8260B	µg/kg	210	ND [12]	ND [15]	ND [11]	ND [14]	ND [12]	ND [15]	ND [14]	ND [12] R	ND [12]	ND [12]	ND [12]	ND [21]	ND [11]	ND [22]	ND [22]	ND [19]	ND [21]	ND [14]
Dibromochloromethane	SW8260B	µg/kg	32	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9]	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
Dibromomethane	SW8260B	µg/kg	1100	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9] ML	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
Dichlorodifluoromethane	SW8260B	µg/kg	140000	ND [19]	ND [24]	ND [18]	ND [23]	ND [19]	ND [24]	ND [23]	ND [20] ML	ND [20]	ND [19]	ND [19]	ND [34]	ND [17]	ND [35]	ND [35]	ND [30]	ND [34]	ND [23]
Ethylbenzene	SW8260B	µg/kg	6900	3.5 [9.6] J	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9] ML	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
Hexachlorobutadiene	SW8260B	µg/kg	120	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9]	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
Isopropylbenzene	SW8260B	µg/kg	51000	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9]	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
Methyl-tert-butyl ether (MTBE)	SW8260B	µg/kg	1300	ND [48]	ND [59]	ND [46]	ND [58]	ND [48]	ND [59]	ND [56]	ND [50]	ND [49]	ND [47]	ND [47]	ND [84]	ND [42]	ND [87]	ND [87]	ND [74]	ND [84]	ND [56]
Methylene chloride	SW8260B	µg/kg	16	ND [19]	ND [24]	ND [18]	ND [23]	ND [19]	ND [24]	ND [23]	ND [20] ML	ND [20]	ND [19]	ND [19]	ND [34]	ND [17]	ND [35]	ND [35]	ND [30]	ND [34]	ND [23]
Naphthalene	SW8260B	µg/kg	20000	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9]	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
Styrene	SW8260B	µg/kg	960	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9]	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
Tetrachloroethene (PCE)	SW8260B	µg/kg	24	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9] ML	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
Toluene	SW8260B	µg/kg	6500	33 [9.6] B	12 [12] J,B	4.8 [9.2] J,B	7.7 [12] J,B	27 [9.6] B	5.1 [12] J,B,Q	ND [11] Q	4.3 [9.9] J,ML,B	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	5.4 [8.5] J,B	ND [17]	ND [17]	16 [15] J,B	ND [17]	5.6 [11] J,B
Trichloroethene (TCE)	SW8260B	µg/kg	20	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9] ML	ND [9.8]	4.1 [9.4] J,Q	ND [9.4] Q	16 [17] J	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
Trichlorofluoromethane	SW8260B	µg/kg	86000	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9] ML	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
Vinyl chloride	SW8260B	µg/kg	8.5	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9] R	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]

Table A-4 Subsurface Soil Sample Results
Fire Training Pits Investigation
Fort Wainwright, Alaska

Sample ID			ADEC Cleanup Level/ [1,2] EPA Screening Level[3]	13FWFP39SO	13FWFP40SO	13FWFP41SO	13FWFP42SO	13FWFP43SO	13FWFP44SO	13FWFP45SO	13FWFP46SO	13FWFP47SO	13FWFP48SO	13FWFP49SO	13FWFP50SO	13FWFP51SO	13FWFP52SO	13FWFP53SO	13FWFP54SO	13FWFP55SO	13FWFP56SO
Boring ID				AP-10278	AP-10278	AP-10279	AP-10279	AP-10280	AP-10280	AP-10280	AP-10281	AP-10281	AP-10282	AP-10282	AP-10282	AP-10283	AP-10283	AP-10283	AP-10284	AP-10284	AP-10285
Location ID				BH1805	BH1812	BH1906	BH1915	BH2005	BH2016	BH20	BH2105	BH2117	BH2206	BH22	BH2216	BH2306	BH2315	BH23	BH2406	BH2415	BH2506
Laboratory				TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC
Lab Sample ID				48971-8	48971-9	48971-12	48971-13	48971-15	48971-16	48971-17	48964-2	48964-3	48964-5	48964-6	48964-7	48964-9	48964-10	48964-11	48964-13	48964-14	48964-16
Collect Date				11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013
Matrix				SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO
Sample Type				Primary	Primary	Primary	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary
Analyte	**Method**	**Units**		**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**
Xylene, Isomers m & p	SW8260B	µg/kg	63000	9.6 [19] J	ND [24]	ND [18]	ND [23]	ND [19]	ND [24]	ND [23]	ND [20] ML	ND [20]	ND [19]	ND [19]	ND [34]	ND [17]	ND [35]	ND [35]	ND [30]	ND [34]	ND [23]
cis-1,2-Dichloroethene	SW8260B	µg/kg	240	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9] ML	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
cis-1,3-Dichloropropene	SW8260B	µg/kg	33	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9] ML	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
n-Butylbenzene	SW8260B	µg/kg	15000	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9]	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
n-Propylbenzene	SW8260B	µg/kg	15000	ND [14]	ND [18]	ND [14]	ND [17]	ND [14]	ND [18]	ND [17]	ND [15]	ND [15]	ND [14]	ND [14]	ND [25]	ND [13]	ND [26]	ND [26]	ND [22]	ND [25]	ND [17]
o-Xylene	SW8260B	µg/kg	63000	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9] ML	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
sec-Butylbenzene	SW8260B	µg/kg	12000	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9]	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
tert-Butylbenzene	SW8260B	µg/kg	12000	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9]	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
trans-1,2-Dichloroethene	SW8260B	µg/kg	370	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9] ML	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
trans-1,3-Dichloropropene	SW8260B	µg/kg	33	ND [9.6]	ND [12]	ND [9.2]	ND [12]	ND [9.6]	ND [12]	ND [11]	ND [9.9] ML	ND [9.8]	ND [9.4]	ND [9.4]	ND [17]	ND [8.5]	ND [17]	ND [17]	ND [15]	ND [17]	ND [11]
1,2,4-Trichlorobenzene	SW8270D	µg/kg	850	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
1,2-Dichlorobenzene	SW8270D	µg/kg	5100	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
1,2-Diphenylhydrazine	SW8270D	µg/kg	28000	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
1,3-Dichlorobenzene	SW8270D	µg/kg	22000	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
1,4-Dichlorobenzene	SW8270D	µg/kg	6200	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
2,4,5-Trichlorophenol	SW8270D	µg/kg	67000	ND [140]	ND [140]	ND [130]	ND [140]	ND [120]	ND [130]	ND [140]	ND [130]	ND [130]	ND [130]	ND [130]	ND [170]	ND [130]	ND [160]	ND [170]	ND [130]	ND [160]	ND [140]
2,4,6-Trichlorophenol	SW8270D	µg/kg	1400	ND [69]	ND [71]	ND [68]	ND [70]	ND [63]	ND [67]	ND [70]	ND [66]	ND [66]	ND [66]	ND [65]	ND [84]	ND [67]	ND [82]	ND [84]	ND [67]	ND [81]	ND [70]
2,4-Dichlorophenol	SW8270D	µg/kg	1300	ND [69]	ND [71]	ND [68]	ND [70]	ND [63]	ND [67]	ND [70]	ND [66]	ND [66]	ND [66]	ND [65]	ND [84]	ND [67]	ND [82]	ND [84]	ND [67]	ND [81]	ND [70]
2,4-Dimethylphenol	SW8270D	µg/kg	8800	ND [140]	ND [140]	ND [130]	ND [140]	ND [120]	ND [130]	ND [140]	ND [130]	ND [130]	ND [130]	ND [130]	ND [170]	ND [130]	ND [160]	ND [170]	ND [130]	ND [160]	ND [140]
2,4-Dinitrophenol	SW8270D	µg/kg	540	ND [700]	ND [720]	ND [690]	ND [710]	ND [640]	ND [680]	ND [710]	ND [670]	ND [670]	ND [670]	ND [660]	ND [850]	ND [680]	ND [840]	ND [860]	ND [680]	ND [820]	ND [710]
2,4-Dinitrotoluene	SW8270D	µg/kg	9.3	ND [140]	ND [140]	ND [130]	ND [140]	ND [120]	ND [130]	ND [140]	ND [130]	ND [130]	ND [130]	ND [130]	ND [170]	ND [130]	ND [160]	ND [170]	ND [130]	ND [160]	ND [140]
2,6-Dichlorophenol	SW8270D	µg/kg	NE	ND [140]	ND [140]	ND [130]	ND [140]	ND [120]	ND [130]	ND [140]	ND [130]	ND [130]	ND [130]	ND [130]	ND [170]	ND [130]	ND [160]	ND [170]	ND [130]	ND [160]	ND [140]
2,6-Dinitrotoluene	SW8270D	µg/kg	9.4	ND [69]	ND [71]	ND [68]	ND [70]	ND [63]	ND [67]	ND [70]	ND [66]	ND [66]	ND [66]	ND [65]	ND [84]	ND [67]	ND [82]	ND [84]	ND [67]	ND [81]	ND [70]
2-Chloronaphthalene	SW8270D	µg/kg	120000	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
2-Chlorophenol	SW8270D	µg/kg	1500	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
2-Methyl-4,6-dinitrophenol	SW8270D	µg/kg	NE	ND [690]	ND [710]	ND [680]	ND [700]	ND [630]	ND [670]	ND [700]	ND [660]	ND [660]	ND [660]	ND [650]	ND [840]	ND [670]	ND [820]	ND [840]	ND [670]	ND [810]	ND [700]
2-Methylnaphthalene	SW8270D	µg/kg	6100	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
2-Methylphenol (o-Cresol)	SW8270D	µg/kg	15000	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
2-Nitroaniline	SW8270D	µg/kg	NE	ND [69]	ND [71]	ND [68]	ND [70]	ND [63]	ND [67]	ND [70]	ND [66]	ND [66]	ND [66]	ND [65]	ND [84]	ND [67]	ND [82]	ND [84]	ND [67]	ND [81]	ND [70]
2-Nitrophenol	SW8270D	µg/kg	NE	ND [69]	ND [71]	ND [68]	ND [70]	ND [63]	ND [67]	ND [70]	ND [66]	ND [66]	ND [66]	ND [65]	ND [84]	ND [67]	ND [82]	ND [84]	ND [67]	ND [81]	ND [70]
3,3'-Dichlorobenzidine	SW8270D	µg/kg	190	ND [340]	ND [360]	ND [340]	ND [350]	ND [310]	ND [340]	ND [350]	ND [330]	ND [330]	ND [330]	ND [330]	ND [420]	ND [340]	ND [410]	ND [420]	ND [340]	ND [410]	ND [350]
3-Methylphenol/4-Methylphenol Coelution	SW8270D	µg/kg	1500	ND [69]	ND [71]	ND [68]	ND [70]	ND [63]	ND [67]	ND [70]	ND [66]	ND [66]	ND [66]	ND [65]	ND [84]	ND [67]	ND [82]	ND [84]	ND [67]	ND [81]	ND [70]
3-Nitroaniline	SW8270D	µg/kg	NE	ND [140]	ND [140]	ND [140]	ND [140]	ND [130]	ND [140]	ND [140]	ND [130]	ND [130]	ND [130]	ND [130]	ND [170]	ND [140]	ND [170]	ND [170]	ND [140]	ND [160]	ND [140]
4-Bromophenyl phenyl ether	SW8270D	µg/kg	NE	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
4-Chloro-3-methylphenol	SW8270D	µg/kg	NE	ND [140]	ND [140]	ND [130]	ND [140]	ND [120]	ND [130]	ND [140]	ND [130]	ND [130]	ND [130]	ND [130]	ND [170]	ND [130]	ND [160]	ND [170]	ND [130]	ND [160]	ND [140]
4-Chloroaniline	SW8270D	µg/kg	57	ND [140]	ND [140]	ND [130]	ND [140]	ND [120]	ND [130]	ND [140]	ND [130]	ND [130]	ND [130]	ND [130]	ND [170]	ND [130]	ND [160]	ND [170]	ND [130]	ND [160]	ND [140]
4-Chlorophenyl phenyl ether	SW8270D	µg/kg	NE	ND [69]	ND [71]	ND [68]	ND [70]	ND [63]	ND [67]	ND [70]	ND [66]	ND [66]	ND [66]	ND [65]	ND [84]	ND [67]	ND [82]	ND [84]	ND [67]	ND [81]	ND [70]
4-Nitroaniline	SW8270D	µg/kg	NE	ND [140]	ND [140]	ND [130]	ND [140]	ND [120]	ND [130]	ND [140]	ND [130]	ND [130]	ND [130]	ND [130]	ND [170]	ND [130]	ND [160]	ND [170]	ND [130]	ND [160]	ND [140]
4-Nitrophenol	SW8270D	µg/kg	NE	ND [340]	ND [360]	ND [340]	ND [350]	ND [310]	ND [340]	ND [350]	ND [330]	ND [330]	ND [330]	ND [330]	ND [420]	ND [340]	ND [410]	ND [420]	ND [340]	ND [410]	ND [350]
Acenaphthene	SW8270D	µg/kg	180000	ND [18]	ND [18]	ND [17]	ND [18]	ND [16]	ND [17]	ND [18]	ND [17]	ND [17]	ND [17]	ND [17]	ND [22]	ND [17]	ND [21]	ND [22]	ND [17]	ND [21]	ND [18]
Acenaphthylene	SW8270D	µg/kg	180000	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
Anthracene	SW8270D	µg/kg	3000000	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
Benzidine	SW8270D	µg/kg	NE	ND [4100]	ND [4300]	ND [4100]	ND [4200]	ND [3800]	ND [4000]	ND [4200]	ND [4000]	ND [4000]	ND [4000]	ND [3900]	ND [5000]	ND [4000]	ND [4900]	ND [5100]	ND [4000]	ND [4900]	ND [4200]
Benzo(a)anthracene	SW8270D	µg/kg	3600	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
Benzo(a)pyrene	SW8270D	µg/kg	2100	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
Benzo(b)fluoranthene	SW8270D	µg/kg	12000	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
Benzo(g,h,i)perylene	SW8270D	µg/kg	38700000	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
Benzo(k)fluoranthene	SW8270D	µg/kg	120000	ND [69]	ND [71]	ND [68]	ND [70]	ND [63]	ND [67]	ND [70]	ND [66]	ND [66]	ND [66]	ND [65]	ND [84]	ND [67]	ND [82]	ND [84]	ND [67]	ND [81]	ND [70]
Benzoic acid	SW8270D	µg/kg	410000	ND [690]	ND [710]	ND [680]	ND [700]	ND [630]	ND [670]	ND [700]	ND [660]	ND [660]	ND [660]	ND [650]	ND [840]	ND [670]	ND [820]	ND [840]	ND [670]	ND [810]	ND [700]
Benzyl alcohol	SW8270D	µg/kg	NE	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
Benzyl butyl phthalate	SW8270D	µg/kg	920000	ND [69]	ND [71]	ND [68]	ND [70]	ND [63]	ND [67]	ND [70]	ND [66]	ND [66]	ND [66]	ND [65]	ND [84]	ND [67]	ND [82]	ND [84]	ND [67]	ND [81]	ND [70]
Carbazole	SW8270D	µg/kg	6500	ND [70]	ND [72]	ND [69]	ND [71]	ND [64]	ND [68]	ND [71]	ND [67]	ND [67]	ND [67]	ND [66]	ND [85]	ND [68]	ND [84]	ND [86]	ND [68]	ND [82]	ND [71]
Chrysene	SW8270D	µg/kg	360000	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
Di-n-butyl phthalate	SW8270D	µg/kg	80000	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
Di-n-octyl phthalate	SW8270D	µg/kg	3800000	ND [69]	ND [71]	ND [68]	ND [70]	ND [63]	ND [67]	ND [70]	ND [66]	ND [66]	ND [66]	ND [65]	ND [84]	ND [67]	ND [82]	ND [84]	ND [67]	ND [81]	ND [70]
Dibenzo(a,h)anthracene	SW8270D	µg/kg	4000	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
Dibenzofuran	SW8270D	µg/kg	11000	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
Diethyl phthalate	SW8270D	µg/kg	130000	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
Dimethyl phthalate	SW8270D	µg/kg	1100000	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	30 [34] J	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	34 [35] J
Fluoranthene	SW8270D	µg/kg	1400000	ND [69]	ND [71]	ND [68]	ND [70]	ND [63]	ND [67]	ND [70]	ND [66]	ND [66]	ND [66]	ND [65]	ND [84]	ND [67]	ND [82]	ND [84]	ND [67]	ND [81]	ND [70]
Fluorene	SW8270D	µg/kg	220000	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
Hexachlorobenzene	SW8270D	µg/kg	47	ND [69]	ND [71]	ND [68]	ND [70]	ND [63]	ND [67]	ND [70]	ND [66]	ND [66]	ND [66]	ND [65]	ND [84]	ND [67]	ND [82]	ND [84]	ND [67]	ND [81]	ND [70]
Hexachlorobutadiene	SW8270D	µg/kg	120	ND [69]	ND [71]	ND [68]	ND [70]	ND [63]	ND [67]	ND [70]	ND [66]	ND [66]	ND [66]	ND [65]	ND [84]	ND [67]	ND [82]	ND [84]	ND [67]	ND [81]	ND [70]
Hexachloroethane	SW8270D	µg/kg	210	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
Indeno(1,2,3-cd)pyrene	SW8270D	µg/kg	41000	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
Isophorone	SW8270D	µg/kg	3100	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
Naphthalene	SW8270D	µg/kg	20000	ND [69]	ND [71]	ND [68]	ND [70]	ND [63]	ND [67]	ND [70]	ND [66]	ND [66]	ND [66]	ND [65]	ND [84]	ND [67]	ND [82]	ND [84]	ND [67]	ND [81]	ND [70]
Nitrobenzene	SW8270D	µg/kg	94	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]

Table A-4 Subsurface Soil Sample Results
Fire Training Pits Investigation
Fort Wainwright, Alaska

Sample ID			ADEC Cleanup Level/ 1,2 EPA Screening Level3	13FWFP39SO	13FWFP40SO	13FWFP41SO	13FWFP42SO	13FWFP43SO	13FWFP44SO	13FWFP45SO	13FWFP46SO	13FWFP47SO	13FWFP48SO	13FWFP49SO	13FWFP50SO	13FWFP51SO	13FWFP52SO	13FWFP53SO	13FWFP54SO	13FWFP55SO	13FWFP56SO
Boring ID				AP-10278	AP-10278	AP-10279	AP-10279	AP-10280	AP-10280	AP-10280	AP-10281	AP-10281	AP-10282	AP-10282	AP-10282	AP-10283	AP-10283	AP-10283	AP-10284	AP-10284	AP-10285
Location ID				BH1805	BH1812	BH1906	BH1915	BH2005	BH2016	BH20	BH2105	BH2117	BH2206	BH22	BH2216	BH2306	BH2315	BH23	BH2406	BH2415	BH2506
Laboratory				TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC
Lab Sample ID				48971-8	48971-9	48971-12	48971-13	48971-15	48971-16	48971-17	48964-2	48964-3	48964-5	48964-6	48964-7	48964-9	48964-10	48964-11	48964-13	48964-14	48964-16
Collect Date				11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013
Matrix				SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO
Sample Type				Primary	Primary	Primary	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary
Analyte	**Method**	**Units**		**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**
Pentachlorophenol	SW8270D	µg/kg	47	ND [700]	ND [720]	ND [690]	ND [710]	ND [640]	ND [680]	ND [710]	ND [670]	ND [670]	ND [670]	ND [660]	ND [850]	ND [680]	ND [840]	ND [860]	ND [680]	ND [820]	ND [710]
Phenanthrene	SW8270D	µg/kg	3000000	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
Phenol	SW8270D	µg/kg	68000	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
Pyrene	SW8270D	µg/kg	1000000	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
bis(2-Chloroisopropyl)ether	SW8270D	µg/kg	NE	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
bis-(2-Chloroethoxy)methane	SW8270D	µg/kg	NE	ND [69]	ND [71]	ND [68]	ND [70]	ND [63]	ND [67]	ND [70]	ND [66]	ND [66]	ND [66]	ND [65]	ND [84]	ND [67]	ND [82]	ND [84]	ND [67]	ND [81]	ND [70]
bis-(2-Chloroethyl)ether	SW8270D	µg/kg	2.2	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
bis-(2-Ethylhexyl)phthalate	SW8270D	µg/kg	13000	ND [69]	ND [71]	ND [68]	ND [70]	ND [63]	ND [67]	ND [70]	ND [66]	ND [66]	ND [66]	ND [65]	ND [84]	ND [67]	ND [82]	ND [84]	ND [67]	ND [81]	ND [70]
n-Nitrosodi-n-propylamine	SW8270D	µg/kg	1.1	ND [69]	ND [71]	ND [68]	ND [70]	ND [63]	ND [67]	ND [70]	ND [66]	ND [66]	ND [66]	ND [65]	ND [84]	ND [67]	ND [82]	ND [84]	ND [67]	ND [81]	ND [70]
n-Nitrosodimethylamine	SW8270D	µg/kg	0.053	ND [69]	ND [71]	ND [68]	ND [70]	ND [63]	ND [67]	ND [70]	ND [66]	ND [66]	ND [66]	ND [65]	ND [84]	ND [67]	ND [82]	ND [84]	ND [67]	ND [81]	ND [70]
n-Nitrosodiphenylamine	SW8270D	µg/kg	15000	ND [34]	ND [36]	ND [34]	ND [35]	ND [31]	ND [34]	ND [35]	ND [33]	ND [33]	ND [33]	ND [33]	ND [42]	ND [34]	ND [41]	ND [42]	ND [34]	ND [41]	ND [35]
n-Nitrosopyrrolidine	SW8270D	µg/kg	NE	ND [140]	ND [140]	ND [130]	ND [140]	ND [120]	ND [130]	ND [140]	ND [130]	ND [130]	ND [130]	ND [130]	ND [170]	ND [130]	ND [160]	ND [170]	ND [130]	ND [160]	ND [140]
4,4'-DDD	SW8081B	µg/kg	7200	ND [0.66]	ND [0.72]	ND [0.67]	ND [0.71]	ND [0.69] QL	ND [0.72]	ND [0.75]	ND [0.67]	ND [0.72]	ND [0.70]	ND [0.66]	ND [0.84]	ND [0.67]	ND [0.81]	ND [0.83]	ND [0.69]	ND [0.85]	ND [0.70]
4,4'-DDE	SW8081B	µg/kg	5100	ND [0.44]	ND [0.48]	ND [0.45]	ND [0.48]	ND [0.46] QL	ND [0.48]	ND [0.50]	0.46 [0.45] J	ND [0.48]	ND [0.47]	ND [0.44]	ND [0.56]	ND [0.45]	ND [0.54]	ND [0.55]	ND [0.46]	ND [0.57]	ND [0.46]
4,4'-DDT	SW8081B	µg/kg	7300	ND [0.66]	ND [0.72]	ND [0.67]	ND [0.71]	ND [0.69] QL	ND [0.72]	ND [0.75]	4.2 [0.67]	ND [0.72]	ND [0.70]	ND [0.66]	ND [0.84]	ND [0.67]	ND [0.81]	ND [0.83]	ND [0.69]	ND [0.85]	ND [0.70]
Aldrin	SW8081B	µg/kg	70	ND [0.44]	ND [0.48]	ND [0.45]	ND [0.48]	ND [0.46] QL	ND [0.48]	ND [0.50]	ND [0.45]	ND [0.48]	ND [0.47]	ND [0.44]	ND [0.56]	ND [0.45]	ND [0.54]	ND [0.55]	ND [0.46]	ND [0.57]	ND [0.46]
alpha-BHC	SW8081B	µg/kg	6.4	ND [0.44]	ND [0.48]	ND [0.45]	ND [0.48]	ND [0.46] QL	ND [0.48]	ND [0.50]	ND [0.45]	ND [0.48]	ND [0.47]	ND [0.44]	ND [0.56]	ND [0.45]	ND [0.54]	ND [0.55]	ND [0.46]	ND [0.57]	ND [0.46]
alpha-Chlordane	SW8081B	µg/kg	2300	ND [0.44]	ND [0.48]	ND [0.45]	ND [0.48]	ND [0.46] QL	ND [0.48]	ND [0.50]	ND [0.45]	ND [0.48]	ND [0.47]	ND [0.44]	ND [0.56]	ND [0.45]	ND [0.54]	ND [0.55]	ND [0.46]	ND [0.57]	ND [0.46]
beta-BHC	SW8081B	µg/kg	22	ND [0.44]	ND [0.48]	ND [0.45]	ND [0.48]	ND [0.46] QL	ND [0.48]	ND [0.50]	ND [0.45]	ND [0.48]	ND [0.47]	ND [0.44]	ND [0.56]	ND [0.45]	ND [0.54]	ND [0.55]	ND [0.46]	ND [0.57]	ND [0.46]
delta-BHC	SW8081B	µg/kg	NE	ND [0.44]	ND [0.48]	ND [0.45]	ND [0.48]	ND [0.46] QL	ND [0.48]	ND [0.50]	ND [0.45]	ND [0.48]	ND [0.47]	ND [0.44]	ND [0.56]	ND [0.45]	ND [0.54]	ND [0.55]	ND [0.46]	ND [0.57]	ND [0.46]
Dieldrin	SW8081B	µg/kg	7.6	ND [0.44]	ND [0.48]	ND [0.45]	ND [0.48]	ND [0.46] QL	ND [0.48]	ND [0.50]	ND [0.45]	ND [0.48]	ND [0.47]	ND [0.44]	ND [0.56]	ND [0.45]	ND [0.54]	ND [0.55]	ND [0.46]	ND [0.57]	ND [0.46]
Endosulfan I	SW8081B	µg/kg	64000	ND [0.44]	ND [0.48]	ND [0.45]	ND [0.48]	ND [0.46] QL	ND [0.48]	ND [0.50]	ND [0.45]	ND [0.48]	ND [0.47]	ND [0.44]	ND [0.56]	ND [0.45]	ND [0.54]	ND [0.55]	ND [0.46]	ND [0.57]	ND [0.46]
Endosulfan II	SW8081B	µg/kg	64000	ND [0.66]	ND [0.72]	ND [0.67]	ND [0.71]	ND [0.69] QL	ND [0.72]	ND [0.75]	ND [0.67]	ND [0.72]	ND [0.70]	ND [0.66]	ND [0.84]	ND [0.67]	ND [0.81]	ND [0.83]	ND [0.69]	ND [0.85]	ND [0.70]
Endosulfan sulfate	SW8081B	µg/kg	NE	ND [0.44]	ND [0.48]	ND [0.45]	ND [0.48]	ND [0.46] QL	ND [0.48]	ND [0.50]	ND [0.45]	ND [0.48]	ND [0.47]	ND [0.44]	ND [0.56]	ND [0.45]	ND [0.54]	ND [0.55]	ND [0.46]	ND [0.57]	ND [0.46]
Endrin	SW8081B	µg/kg	290	ND [0.66]	ND [0.72]	ND [0.67]	ND [0.71]	ND [0.69] QL	ND [0.72]	ND [0.75]	ND [0.67]	ND [0.72]	ND [0.70]	ND [0.66]	ND [0.84]	ND [0.67]	ND [0.81]	ND [0.83]	ND [0.69]	ND [0.85]	ND [0.70]
Endrin aldehyde	SW8081B	µg/kg	NE	ND [0.66]	ND [0.72]	ND [0.67]	ND [0.71]	ND [0.69] QL	ND [0.72]	ND [0.75]	ND [0.67]	ND [0.72]	ND [0.70]	ND [0.66]	ND [0.84]	ND [0.67]	ND [0.81]	ND [0.83]	ND [0.69]	ND [0.85]	ND [0.70]
Endrin ketone	SW8081B	µg/kg	NE	ND [26]	ND [28]	ND [26]	ND [28]	ND [27] QL	ND [28]	ND [29]	ND [26]	ND [28]	ND [27]	ND [26]	ND [33]	ND [26]	ND [32]	ND [32]	ND [27]	ND [33]	ND [27]
gamma-BHC (Lindane)	SW8081B	µg/kg	9.5	ND [0.44]	ND [0.48]	ND [0.45]	ND [0.48]	ND [0.46] QL	ND [0.48]	ND [0.50]	ND [0.45]	ND [0.48]	ND [0.47]	ND [0.44]	ND [0.56]	ND [0.45]	ND [0.54]	ND [0.55]	ND [0.46]	ND [0.57]	ND [0.46]
gamma-Chlordane	SW8081B	µg/kg	2300	ND [0.44]	ND [0.48]	ND [0.45]	ND [0.48]	ND [0.46] QL	ND [0.48]	ND [0.50]	ND [0.45]	ND [0.48]	ND [0.47]	ND [0.44]	ND [0.56]	ND [0.45]	ND [0.54]	ND [0.55]	ND [0.46]	ND [0.57]	ND [0.46]
Heptachlor	SW8081B	µg/kg	280	ND [0.66]	ND [0.72]	ND [0.67]	ND [0.71]	ND [0.69] QL	ND [0.72]	ND [0.75]	ND [0.67]	ND [0.72]	ND [0.70]	ND [0.66]	ND [0.84]	ND [0.67]	ND [0.81]	ND [0.83]	ND [0.69]	ND [0.85]	ND [0.70]
Heptachlor epoxide	SW8081B	µg/kg	14	ND [0.66]	ND [0.72]	ND [0.67]	ND [0.71]	ND [0.69] QL	ND [0.72]	ND [0.75]	ND [0.67]	ND [0.72]	ND [0.70]	ND [0.66]	ND [0.84]	ND [0.67]	ND [0.81]	ND [0.83]	ND [0.69]	ND [0.85]	ND [0.70]
Methoxychlor	SW8081B	µg/kg	23000	ND [0.66]	ND [0.72]	ND [0.67]	ND [0.71]	ND [0.69] QL	ND [0.72]	ND [0.75]	ND [0.67]	ND [0.72]	ND [0.70]	ND [0.66]	ND [0.84]	ND [0.67]	ND [0.81]	ND [0.83]	ND [0.69]	ND [0.85]	ND [0.70]
Toxaphene	SW8081B	µg/kg	3900	ND [0.66]	ND [0.72]	ND [0.67]	ND [0.71]	ND [0.69] QL	ND [0.72]	ND [0.75]	ND [0.67]	ND [0.72]	ND [0.70]	ND [0.66]	ND [0.84]	ND [0.67]	ND [0.81]	ND [0.83]	ND [0.69]	ND [0.85]	ND [0.70]
PCB-1016 (Aroclor 1016)	SW8082A	µg/kg		ND [9.6]	ND [10]	ND [9.8]	ND [10]	ND [10]	ND [10]	ND [11]	ND [9.8]	ND [10]	ND [10]	ND [9.6]	ND [12]	ND [9.7]	ND [12]	ND [12]	ND [10]	ND [12]	ND [10]
PCB-1221 (Aroclor 1221)	SW8082A	µg/kg		ND [19]	ND [21]	ND [20]	ND [21]	ND [20]	ND [21]	ND [22]	ND [20]	ND [21]	ND [20]	ND [19]	ND [24]	ND [19]	ND [24]	ND [24]	ND [20]	ND [25]	ND [20]
PCB-1232 (Aroclor 1232)	SW8082A	µg/kg		ND [14]	ND [16]	ND [15]	ND [16]	ND [15]	ND [16]	ND [16]	ND [15]	ND [16]	ND [15]	ND [14]	ND [18]	ND [15]	ND [18]	ND [18]	ND [15]	ND [18]	ND [15]
PCB-1242 (Aroclor 1242)	SW8082A	µg/kg	1000	ND [9.6]	ND [10]	ND [9.8]	ND [10]	ND [10]	ND [10]	ND [11]	ND [9.8]	ND [10]	ND [10]	ND [9.6]	ND [12]	ND [9.7]	ND [12]	ND [12]	ND [10]	ND [12]	ND [10]
PCB-1248 (Aroclor 1248)	SW8082A	µg/kg		ND [9.6]	ND [10]	ND [9.8]	ND [10]	ND [10]	ND [10]	ND [11]	ND [9.8]	ND [10]	ND [10]	ND [9.6]	ND [12]	ND [9.7]	ND [12]	ND [12]	ND [10]	ND [12]	ND [10]
PCB-1254 (Aroclor 1254)	SW8082A	µg/kg		ND [9.6]	ND [10]	ND [9.8]	ND [10]	ND [10]	ND [10]	ND [11]	ND [9.8]	ND [10]	ND [10]	ND [9.6]	ND [12]	ND [9.7]	ND [12]	ND [12]	ND [10]	ND [12]	ND [10]
PCB-1260 (Aroclor 1260)	SW8082A	µg/kg		ND [9.6]	ND [10]	ND [9.8]	ND [10]	ND [10]	ND [10]	ND [11]	ND [9.8]	ND [10]	ND [10]	ND [9.6]	ND [12]	ND [9.7]	ND [12]	ND [12]	ND [10]	ND [12]	ND [10]
Perfluorobutane Sulfonate (PFBS)	DVLC012	µg/kg	NE	ND [0.60]	ND [0.64]	ND [0.61]	ND [0.62]	ND [0.60]	ND [0.66]	ND [0.65]	ND [0.60]	ND [0.64]	0.48 [0.59] J	0.37 [0.60] J	ND [0.76]	0.92 [0.61]	0.28 [0.74] J	0.29 [0.73] J	ND [0.62]	ND [0.74]	ND [0.65]
Perfluorobutyric acid (PFBTA)	DVLC012	µg/kg	NE	ND [0.60]	ND [0.64]	ND [0.61]	ND [0.62]	ND [0.60]	ND [0.66]	ND [0.65]	ND [0.60]	ND [0.64]	ND [0.59]	ND [0.60]	ND [0.76]	0.25 [0.61] J	ND [0.74] Q	0.32 [0.73] J,Q	0.19 [0.62] J	ND [0.74]	ND [0.65]
Perfluorodecane Sulfonate (PFDCS)	DVLC012	µg/kg	NE	ND [0.60]	ND [0.64]	ND [0.61]	ND [0.62]	ND [0.60]	ND [0.66]	ND [0.65]	ND [0.60]	ND [0.64]	ND [0.59]	ND [0.60]	ND [0.76]	0.86 [0.61]	ND [0.74]	ND [0.73]	ND [0.62]	ND [0.74]	ND [0.65]
Perfluorododecanoic acid (PFDOA)	DVLC012	µg/kg	NE	ND [0.60]	ND [0.64]	ND [0.61]	ND [0.62]	ND [0.60]	ND [0.66]	ND [0.65]	ND [0.60]	ND [0.64]	ND [0.59]	ND [0.60]	ND [0.76]	ND [0.61]	ND [0.74]	ND [0.73]	ND [0.62]	ND [0.74]	ND [0.65]
Perfluorohexanoic acid (PFHA)	DVLC012	µg/kg	NE	ND [0.60]	ND [0.64]	1.2 [0.61]	ND [0.62]	ND [0.60]	ND [0.66]	ND [0.65]	ND [0.60]	ND [0.64]	1.8 [0.59]	2.1 [0.60]	ND [0.76]	3.7 [0.61]	0.63 [0.74] J	0.55 [0.73] J	1.4 [0.62]	ND [0.74]	ND [0.65]
Perfluoroheptanoic acid (PFHPA)	DVLC012	µg/kg	NE	ND [0.60]	ND [0.64]	ND [0.61]	ND [0.62]	ND [0.60]	ND [0.66]	ND [0.65]	ND [0.60]	ND [0.64]	0.71 [0.59] J	0.86 [0.60]	ND [0.76]	0.73 [0.61] J	ND [0.74]	ND [0.73]	0.17 [0.62] J	ND [0.74]	0.18 [0.65] J
Perfluorohexane Sulfonate (PFHXS)	DVLC012	µg/kg	NE	2.0 [0.60]	0.91 [0.64]	36 [0.61]	0.64 [0.62] J	0.65 [0.60] J	ND [0.66]	ND [0.65]	ND [0.60]	ND [0.64]	17 [0.59]	18 [0.60]	0.92 [0.76] J	14 [0.61]	1.0 [0.74]	ND [0.73]	1.0 [0.62]	ND [0.74]	1.4 [0.65]
Perfluorononanoic acid (PFNA)	DVLC012	µg/kg	NE	ND [0.60]	ND [0.64]	ND [0.61]	ND [0.62]	ND [0.60]	ND [0.66]	ND [0.65]	ND [0.60]	ND [0.64]	ND [0.59]	ND [0.60]	ND [0.76]	0.62 [0.61] J	ND [0.74]	ND [0.73]	ND [0.62]	ND [0.74]	ND [0.65]
Perfluorodecanoic acid (PFNDCA)	DVLC012	µg/kg	NE	ND [0.60]	ND [0.64]	ND [0.61]	ND [0.62]	ND [0.60]	ND [0.66]	ND [0.65]	ND [0.60]	ND [0.64]	ND [0.59]	ND [0.60]	ND [0.76]	ND [0.61]	ND [0.74]	ND [0.73]	ND [0.62]	ND [0.74]	ND [0.65]
Perfluorooctanoic acid (PFOA)	DVLC012	µg/kg	142 / 2030 2 (16000)3	ND [0.60]	ND [0.64]	15 [0.61]	ND [0.62]	ND [0.60]	ND [0.66]	ND [0.65]	ND [0.60]	ND [0.64]	1.0 [0.59]	1.5 [0.60]	ND [0.76]	2.4 [0.61]	ND [0.74]	ND [0.73]	0.24 [0.62] J	ND [0.74]	0.40 [0.65] J
Perfluorooctane Sulfonate (PFOS)	DVLC012	µg/kg	571 / 3040 2 (6000)3	5.3 [0.60]	ND [0.64]	58 [0.61]	ND [0.62]	ND [0.60]	ND [0.66]	ND [0.65]	ND [0.60]	ND [0.64]	0.79 [0.59]	0.96 [0.60]	ND [0.76]	**710 [0.61]**	ND [0.74]	ND [0.73]	ND [0.62]	ND [0.74]	4.0 [0.65]
Perfluorooctane Sulfonamide (PFOSA)	DVLC012	µg/kg	NE	ND [0.60]	ND [0.64]	0.11 [0.61] J	ND [0.62]	ND [0.60]	ND [0.66]	ND [0.65]	ND [0.60]	ND [0.64]	ND [0.59]	ND [0.60]	ND [0.76]	0.40 [0.61] J	ND [0.74]	ND [0.73]	ND [0.62]	ND [0.74]	ND [0.65]
Perfluoropentanoic acid (PFPA)	DVLC012	µg/kg	NE	ND [0.60]	ND [0.64]	ND [0.61]	ND [0.62]	ND [0.60]	ND [0.66]	ND [0.65]	0.33 [0.60] J	ND [0.64]	0.83 [0.59]	1.3 [0.60]	ND [0.76]	1.6 [0.61]	0.60 [0.74] J	0.56 [0.73] J	3.7 [0.62]	ND [0.74]	ND [0.65]
Perfluorotetradecanoic acid (PFTEDA)	DVLC012	µg/kg	NE	ND [0.60]	ND [0.64]	ND [0.61]	ND [0.62]	ND [0.60]	ND [0.66]	ND [0.65]	ND [0.60]	ND [0.64]	ND [0.59]	ND [0.60]	ND [0.76]	ND [0.61]	ND [0.74]	ND [0.73]	ND [0.62]	ND [0.74]	ND [0.65]
Perfluorotridecanoic acid (PFTRIDA)	DVLC012	µg/kg	NE	ND [0.60]	ND [0.64]	ND [0.61]	ND [0.62]	ND [0.60]	ND [0.66]	ND [0.65]	ND [0.60]	ND [0.64]	ND [0.59]	ND [0.60]	ND [0.76]	ND [0.61]	ND [0.74]	ND [0.73]	ND [0.62]	ND [0.74]	ND [0.65]
Perfluoroundecanoic acid (PFUNDCA)	DVLC012	µg/kg	NE	ND [0.60]	ND [0.64]	ND [0.61]	ND [0.62]	ND [0.60]	ND [0.66]	ND [0.65]	ND [0.60]	ND [0.64]	ND [0.59]	ND [0.60]	ND [0.76]	ND [0.61]	ND [0.74]	ND [0.73]	ND [0.62]	ND [0.74]	ND [0.65]
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpC	SW8290A	pg/g	NE	0.67 [0.088] J	0.38 [0.076] J	0.22 [0.085] J	ND [0.088]	ND [0.14]	ND [0.14]	ND [0.15]	0.22 [0.052] J	0.26 [0.039] J,B	0.064[0.025]J,B,Q	5.6 [0.087] Q	ND [0.038]	0.069[0.031] J,B	ND [0.033]	ND [0.030]	0.46 [0.038] J,B	0.59[0.044] J,B	0.17[0.046] J,B
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxins-C13	SW8290A	pg/g	NE	66 [0]	64 [0]	58 [0]	67 [0]	59 [0]	61 [0]	58 [0]	48 [0]	63 [0]	79 [0]	70 [0]	73 [0]	74 [0]	78 [0]	74 [0]	75 [0]	69 [0]	80 [0]
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	SW8290A	pg/g	NE	0.48 [0.084] J	0.30 [0.059] J	0.34 [0.058] J	0.15 [0.050] J	0.30 [0.075] J	0.12 [0.076] J,Q	0.30 [0.094] J,Q	1.3 [0.055] J,B	0.89 [0.035] J,B	0.23[0.022] J,B,Q	310 [0.24] Q	0.50 [0.038] J,B	0.30[0.024] J,B	0.35[0.030] J,B	0.54[0.033] J,B	0.33[0.024] J,B	0.82[0.035] J,B	0.60[0.051] J,B
1,2,3,4,6,7,8-Heptachlorodibenzofurans-C13	SW8290A	pg/g	NE	55 [0]	55 [0]	50 [0]	62 [0]	54 [0]	59 [0]	53 [0]	58 [0]	60 [0]	72 [0]	67 [0]	68 [0]	69 [0]	73 [0]	69 [0]	71 [0]	65 [0]	73 [0]
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	SW8290A	pg/g	NE	ND [0.099]	ND [0.071]	ND [0.069]	ND [0.060]	ND [0.089]	ND [0.090]	ND [0.11]	ND [0.066]	ND [0.042]	ND [0.026] Q	9.5 [0.29] Q	ND [0.045]	ND [0.028]	ND [0.035]	ND [0.039]	ND [0.028]	ND [0.041]	ND [0.060]
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD	SW8290A	pg/g	NE	ND [0.061]	ND [0.065]	ND [0.048]	ND [0.069]	ND [0.082]	ND [0.071]	ND [0.12]	ND [0.043]	ND [0.048]	ND [0.027] Q	0.22[0.039]J,Q	ND [0.034]	ND [0.027]	ND [0.030]	ND [0.033]	ND [0.029]	ND [0.030]	ND [0.054]
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	SW8290A	pg/g	NE	ND [0.12]	ND [0.042]	ND [0.056]	ND [0.057]	ND [0.051]	ND [0.074]	ND [0.095]	0.24 [0.050] J,B	0.21 [0.032] J,B	0.077[0.024]J,B,Q	93 [0.11] Q	0.20[0.035] J,B	0.098[0.023] J,B	0.17[0.027] J,B	0.14[0.030] J,B	ND [0.024]	0.36[0.029] J,B	0.29[0.047] J,B
1,2,3,4,7,8-Hexachlorodibenzofuran-C13	SW8290A	pg/g	NE	56 [0]	54 [0]	50 [0]	59 [0]	56 [0]	58 [0]	56 [0]	64 [0]	51 [0]	65 [0]	57 [0]	61 [0]	59 [0]	66 [0]	62 [0]	61 [0]	56 [0]	66 [0]

Table A-4 Subsurface Soil Sample Results
Fire Training Pits Investigation
Fort Wainwright, Alaska

Analyte	Method	Units	ADEC Cleanup Level/ [1,2] EPA Screening Level[3]	13FWFP39SO	13FWFP40SO	13FWFP41SO	13FWFP42SO	13FWFP43SO	13FWFP44SO	13FWFP45SO	13FWFP46SO	13FWFP47SO
Boring ID				AP-10278	AP-10278	AP-10279	AP-10279	AP-10280	AP-10280	AP-10280	AP-10281	AP-10281
Location ID				BH1805	BH1812	BH1906	BH1915	BH2005	BH2016	BH20	BH2105	BH2117
Laboratory				TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC
Lab Sample ID				48971-8	48971-9	48971-12	48971-13	48971-15	48971-16	48971-17	48964-2	48964-3
Collect Date				11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/02/2013	11/04/2013	11/04/2013
Matrix				SO	SO	SO	SO	SO	SO	SO	SO	SO
Sample Type				Primary	Primary	Primary	Primary	Primary	Primary	Field Duplicate	Primary	Primary
				Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	SW8290A	pg/g	NE	ND [0.049]	ND [0.052]	ND [0.039]	ND [0.056]	ND [0.066]	ND [0.057]	ND [0.097]	ND [0.032]	ND [0.034]
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin-C13	SW8290A	pg/g	NE	75 [0]	74 [0]	72 [0]	80 [0]	78 [0]	77 [0]	77 [0]	60 [0]	50 [0]
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	SW8290A	pg/g	NE	ND [0.044]	ND [0.035]	ND [0.047]	ND [0.047]	ND [0.042]	ND [0.061]	ND [0.079]	ND [0.038]	ND [0.024]
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	SW8290A	pg/g	NE	ND [0.048]	ND [0.051]	ND [0.037]	ND [0.054]	ND [0.064]	ND [0.055]	ND [0.094]	ND [0.030]	ND [0.035]
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	SW8290A	pg/g	NE	ND [0.055]	ND [0.044]	ND [0.058]	ND [0.059]	ND [0.053]	ND [0.077]	ND [0.099]	ND [0.049]	ND [0.031]
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	SW8290A	pg/g	NE	ND [0.15]	ND [0.14]	ND [0.12]	ND [0.20]	ND [0.22]	ND [0.25]	ND [0.24]	ND [0.058]	ND [0.048]
1,2,3,7,8-Pentachlorodibenzo-p-dioxin-C13	SW8290A	pg/g	NE	74 [0]	76 [0]	64 [0]	68 [0]	65 [0]	63 [0]	61 [0]	58 [0]	49 [0]
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	SW8290A	pg/g	NE	ND [0.091]	ND [0.11]	ND [0.069]	ND [0.12]	ND [0.16]	ND [0.19]	ND [0.21]	ND [0.050]	ND [0.039]
1,2,3,7,8-Pentachlorodibenzofurans-C13	SW8290A	pg/g	NE	67 [0]	65 [0]	59 [0]	63 [0]	58 [0]	57 [0]	57 [0]	61 [0]	47 [0]
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	SW8290A	pg/g	NE	ND [0.050]	ND [0.039]	ND [0.052]	ND [0.053]	ND [0.047]	ND [0.069]	ND [0.089]	ND [0.043]	0.051 [0.028] J
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	SW8290A	pg/g	NE	ND [0.096]	ND [0.11]	ND [0.073]	ND [0.12]	ND [0.17]	ND [0.20]	ND [0.22]	ND [0.052]	ND [0.041]
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	SW8290A	pg/g	47	ND [0.082]	ND [0.079]	ND [0.089]	ND [0.093]	ND [0.10]	ND [0.13]	ND [0.15]	ND [0.040]	ND [0.039]
2,3,7,8-Tetrachlorodibenzo-p-dioxin-C13	SW8290A	pg/g	NE	73 [0]	71 [0]	63 [0]	76 [0]	72 [0]	70 [0]	71 [0]	57 [0]	50 [0]
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	SW8290A	pg/g	NE	ND [0.091]	ND [0.082]	ND [0.074]	ND [0.12]	ND [0.13]	ND [0.13]	ND [0.17]	ND [0.028]	ND [0.032]
2,3,7,8-Tetrachlorodibenzofuran-C13	SW8290A	pg/g	NE	70 [0]	66 [0]	63 [0]	73 [0]	69 [0]	69 [0]	67 [0]	64 [0]	45 [0]
Octachlorodibenzo-p-dioxin (OCDD)	SW8290A	pg/g	NE	5.9 [0.16] J	1.9 [0.089] J	1.9 [0.15] J	0.089[0.075] J	ND [0.14]	ND [0.17]	ND [0.24]	0.74[0.059] J,B	2.5 [0.061] J,B
Octachlorodibenzo-p-dioxin-C13	SW8290A	pg/g	NE	60 [0]	57 [0]	53 [0]	64 [0]	51 [0]	56 [0]	50 [0]	45 [0]	67 [0]
Octachlorodibenzofuran (OCDF)	SW8290A	pg/g	NE	0.50[0.12] J,B	0.41[0.11] J,B	0.33[0.11] J,B	ND [0.093]	ND [0.22]	ND [0.14]	ND [0.28]	0.96[0.11] J,B	0.55 [0.063] J,B
Total Heptachlorodibenzo-p-dioxins (HpCDD)	SW8290A	pg/g	NE	1.3[0.088] J,B	0.69[0.076] J,B	0.53[0.085] J,B	ND [0.12]	ND [0.14]	ND [0.14]	ND [0.15]	0.78 [0.052] J,B	0.52 [0.039] J,B
Total Heptachlorodibenzofurans (HpCDF)	SW8290A	pg/g	NE	0.48[0.092] J	0.30 [0.065] J	0.34 [0.063] J	0.15[0.055] J	0.30[0.082] J	0.12[0.083] J,Q	0.30 [0.10] J,Q	1.3 [0.060] J,B	0.89 [0.038] J,B
Total Hexachlorodibenzo-p-dioxins (HxCDD)	SW8290A	pg/g	NE	ND [0.061]	ND [0.065]	ND [0.048]	ND [0.069]	0.17[0.070] J	ND [0.071]	ND [0.12]	ND [0.043]	ND [0.048]
Total Hexachlorodibenzofurans (HxCDF)	SW8290A	pg/g	NE	ND [0.12]	ND [0.044]	ND [0.058]	ND [0.059]	ND [0.053]	ND [0.077]	ND [0.099]	0.24[0.045] J,B	0.26 [0.029] J,B
Total Pentachlorodibenzo-p-dioxin (PeCDD)	SW8290A	pg/g	NE	ND [0.15]	ND [0.14]	ND [0.12]	ND [0.20]	ND [0.22]	ND [0.25]	ND [0.24]	ND [0.058]	ND [0.048]
Total Pentachlorodibenzofurans (PeCDF)	SW8290A	pg/g	NE	ND [0.096]	ND [0.11]	ND [0.073]	ND [0.12]	ND [0.17]	ND [0.20]	ND [0.22]	ND [0.052]	ND [0.041]
Total Tetrachlorodibenzo-p-dioxins (TCDD)	SW8290A	pg/g	NE	ND [0.082]	ND [0.079]	ND [0.094]	ND [0.093]	ND [0.10]	ND [0.13]	ND [0.15]	ND [0.040]	0.22 [0.039] J
Total Tetrachlorodibenzofurans (TCDF)	SW8290A	pg/g	NE	ND [0.091]	ND [0.082]	ND [0.14]	ND [0.12]	ND [0.13]	ND [0.13]	ND [0.17]	ND [0.028]	ND [0.032]
Total Dioxin/Furan TEQ	SW8290A	pg/g	47 [4,5]	0.013	0.0075	0.0063	0.0015	0.003	0.0012	0.003	0.04	0.039

Analyte	Method	Units	ADEC Cleanup Level/ [1,2] EPA Screening Level[3]	13FWFP48SO	13FWFP49SO	13FWFP50SO	13FWFP51SO	13FWFP52SO	13FWFP53SO	13FWFP54SO	13FWFP55SO	13FWFP56SO
Boring ID				AP-10282	AP-10282	AP-10282	AP-10283	AP-10283	AP-10283	AP-10284	AP-10284	AP-10285
Location ID				BH2206	BH22	BH2216	BH2306	BH2315	BH23	BH2406	BH2415	BH2506
Laboratory				TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC	TADC
Lab Sample ID				48964-5	48964-6	48964-7	48964-9	48964-10	48964-11	48964-13	48964-14	48964-16
Collect Date				11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013	11/04/2013
Matrix				SO	SO	SO	SO	SO	SO	SO	SO	SO
Sample Type				Primary	Field Duplicate	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary
				Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier	Result[LOD] Qualifier
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	SW8290A	pg/g	NE	ND [0.019] Q	0.58[0.028] J,Q	ND [0.024]	ND [0.019]	ND [0.021]	ND [0.023]	ND [0.021]	ND [0.021]	ND [0.038]
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin-C13	SW8290A	pg/g	NE	65 [0]	57 [0]	62 [0]	64 [0]	67 [0]	63 [0]	63 [0]	56 [0]	65 [0]
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	SW8290A	pg/g	NE	0.032[0.018] J,Q	13 [0.082] Q	0.082 [0.026] J	0.057 [0.017] J	0.11[0.020] J,Q	ND [0.022] Q	ND [0.041]	ND [0.022]	ND [0.088]
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	SW8290A	pg/g	NE	ND [0.019] Q	0.37[0.028] J,Q	ND [0.025]	ND [0.020]	ND [0.026]	ND [0.024]	ND [0.021]	0.14 [0.022] J	ND [0.039]
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	SW8290A	pg/g	NE	ND [0.023] Q	ND [0.11] Q	ND [0.034]	ND [0.023]	ND [0.026]	ND [0.029]	ND [0.023]	ND [0.028]	ND [0.045]
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	SW8290A	pg/g	NE	ND [0.031] Q	0.18[0.045] J,Q	ND [0.045]	ND [0.033]	ND [0.037]	ND [0.042]	ND [0.037]	ND [0.039]	ND [0.065]
1,2,3,7,8-Pentachlorodibenzo-p-dioxin-C13	SW8290A	pg/g	NE	62 [0]	57 [0]	59 [0]	59 [0]	62 [0]	62 [0]	60 [0]	57 [0]	64 [0]
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	SW8290A	pg/g	NE	ND [0.026] Q	0.75[0.071] J,Q	ND [0.039]	ND [0.029]	ND [0.032]	ND [0.032]	ND [0.025]	ND [0.038]	ND [0.053]
1,2,3,7,8-Pentachlorodibenzofurans-C13	SW8290A	pg/g	NE	61 [0]	55 [0]	58 [0]	58 [0]	61 [0]	59 [0]	58 [0]	55 [0]	61 [0]
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	SW8290A	pg/g	NE	ND [0.021] Q	3.9 [0.096] J,Q	ND [0.031]	ND [0.020]	ND [0.023]	ND [0.026]	ND [0.021]	ND [0.026]	ND [0.041]
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	SW8290A	pg/g	NE	ND [0.027] Q	5.5 [0.074] Q	ND [0.041]	ND [0.030]	ND [0.034]	ND [0.034]	ND [0.026]	ND [0.035]	ND [0.055]
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	SW8290A	pg/g	47	ND [0.026]	ND [0.033]	ND [0.034]	ND [0.025]	ND [0.032]	ND [0.037]	ND [0.027]	ND [0.034]	ND [0.050]
2,3,7,8-Tetrachlorodibenzo-p-dioxin-C13	SW8290A	pg/g	NE	64 [0]	59 [0]	62 [0]	63 [0]	64 [0]	61 [0]	63 [0]	58 [0]	68 [0]
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	SW8290A	pg/g	NE	ND [0.020] Q	ND [0.15] Q	ND [0.025]	ND [0.023]	ND [0.026]	ND [0.024]	ND [0.020]	ND [0.027]	ND [0.034]
2,3,7,8-Tetrachlorodibenzofuran-C13	SW8290A	pg/g	NE	58 [0]	61 [0]	55 [0]	56 [0]	58 [0]	56 [0]	56 [0]	53 [0]	59 [0]
Octachlorodibenzo-p-dioxin (OCDD)	SW8290A	pg/g	NE	0.26 [0.033] J,B,Q	65 [0.14] Q	0.37[0.047] J,B	1.1 [0.038] J,B	0.42 [0.045] J,B	0.52 [0.051] J,B	3.2[0.052] J,B	3.4 [0.057] J,B	0.81 [0.068] J,B
Octachlorodibenzo-p-dioxin-C13	SW8290A	pg/g	NE	80 [0]	71 [0]	72 [0]	75 [0]	79 [0]	75 [0]	75 [0]	72 [0]	81 [0]
Octachlorodibenzofuran (OCDF)	SW8290A	pg/g	NE	ND [0.039] Q	530 [0.40] Q	0.39[0.065]J,B	0.73[0.049] J,B	0.12[0.062]J,B,Q	0.36[0.063]J,B,Q	0.34[0.047] J,B	0.97[0.051] J,B	0.71[0.083] J,B
Total Heptachlorodibenzo-p-dioxins (HpCDD)	SW8290A	pg/g	NE	0.17[0.025] J,B,Q	12 [0.087] Q	0.12[0.038]J,B	0.21[0.031] J,B	0.14 [0.033] J,B	0.12 [0.030] J,B	0.91[0.038] J,B	1.4 [0.044] J,B	0.40[0.046] J,B
Total Heptachlorodibenzofurans (HpCDF)	SW8290A	pg/g	NE	0.23[0.024] J,B,Q	360 [0.26] Q	0.50[0.041]J,B	0.30[0.026] J,B	0.35 [0.032] J,B	0.54 [0.036] J,B	0.40[0.026] J,B	1.1 [0.038] J,B	0.60[0.056] J,B
Total Hexachlorodibenzo-p-dioxins (HxCDD)	SW8290A	pg/g	NE	ND [0.027] Q	4.4[0.032] J,Q	ND [0.034]	ND [0.027]	ND [0.030]	ND [0.033]	ND [0.094]	0.22 [0.024] J	0.084[0.044] J
Total Hexachlorodibenzofurans (HxCDF)	SW8290A	pg/g	NE	0.11[0.021] J,B,Q	160 [0.099] Q	0.33[0.032]J,B	0.16[0.021] J,B	0.62[0.024]J,B,Q	0.14[0.027]J,B,Q	ND [0.041]	0.46[0.026]J,B	0.29[0.055] J,B
Total Pentachlorodibenzo-p-dioxin (PeCDD)	SW8290A	pg/g	NE	ND [0.057] Q	1.8[0.045] J,Q	ND [0.045]	ND [0.033]	ND [0.037]	ND [0.042]	ND [0.037]	ND [0.039]	ND [0.065]
Total Pentachlorodibenzofurans (PeCDF)	SW8290A	pg/g	NE	ND [0.027] Q	32 [0.072] Q	ND [0.041]	ND [0.030]	0.11[0.033] J,Q	ND [0.034] Q	ND [0.026]	0.11 [0.036] J	ND [0.055]
Total Tetrachlorodibenzo-p-dioxins (TCDD)	SW8290A	pg/g	NE	0.045[0.026] J,Q	0.32[0.033]J,Q	0.12[0.034] J	0.11 [0.025] J	ND [0.032] Q	0.22 [0.037] J,Q	0.061[0.027] J	0.27 [0.034] J	0.31[0.050] J
Total Tetrachlorodibenzofurans (TCDF)	SW8290A	pg/g	NE	ND [0.020] Q	4.4 [0.033] Q	ND [0.025]	ND [0.023]	0.099[0.026]J,Q	ND [0.024] Q	0.054[0.020] J	ND [0.027]	ND [0.034]
Total Dioxin/Furan TEQ	SW8290A	pg/g	47 [4,5]	0.014	16	0.033	0.02	0.032	0.02	0.009	0.065	0.037

Yellow highlighted and **bolded** results exceed ADEC soil cleanup levels (most stringent pathway).
Green highlighted results exceed ADEC's proposed migration to groundwater cleanup level (applies to PFOA or PFOS only).
Grey highlighted results are non-detect with LODs above cleanup levels.

[1] Cleanup levels are from ADEC Title 18, Alaska Administrative Code, Section 75.341, Tables B1 and B2 (ADEC, 2012).

[2] Proposed cleanup levels for PFOA and PFOS (migration to groundwater / human health) are from the Public Comment Draft of 18 AAC 75 dated August 26, 2015.

[3] EPA Region 4 Residential Soil Screening Levels from "Soil Screening Levels for Perfluorooctanoic Acid (PFOA) and Perfluorooctyl Sulfonate (PFOS)"

[4] Total TEQs are presented for each sample (none of which exceed the ADEC cleanup level). Analyte-specific TEQs are presented in the associated laboratory reports. Total TEQ = $\Sigma(C_i * TEF_i)$

[5] TEFs (used to calculate TEQs) are established from the World Health Organization (WHO, 2005).

LOD - limit of detection
LOQ - limit of quantitation
µg/kg - micrograms per kilogram
mg/kg - milligrams per kilogram
NA - not applicable
NE - not established
PFC - perfluorinated compounds
pg/g - picograms per gram
QC - quality control
SO - subsurface soil matrix
SQ - soil QC
TADC - TestAmerica Laboratories of Denver, CO
TEF - toxicity equivalency factor
TEQ - toxicity equivalence, where Total TEQ = $\Sigma(C_i * TEF_i)$

Data Qualifiers:
B - result may be due to cross-contamination
J - result qualified as estimate because it is less than the LOQ
M - result considered an estimate (L - low; H - high) due to matrix interference
ND - non-detect (LOD in parentheses)
Q - result considered an estimate (L - low; H - high) due to a QC failure
R - result rejected due to QC issue

Table A-4 Subsurface Soil Sample Results
Fire Training Pits Investigation
Fort Wainwright, Alaska

		Sample ID	ADEC Cleanup Level/[1,2] EPA Screening Level[3]	13FWFP57SO	13M27SQ	13M28SQ	13M29SQ	13M30SQ	13M31SQ
		Boring ID		AP-10285	Trip Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank
		Location ID		BH2515	NA	NA	NA	NA	NA
		Laboratory		TADC	TADC	TADC	TADC	TADC	TADC
		Lab Sample ID		48964-17	48825-18	48840-18	48809-8	48971-18	48964-18
		Collect Date		11/04/2013	10/31/2013	10/31/2013	11/01/2013	11/02/2013	11/04/2013
		Matrix		SO	SQ	SQ	SQ	SQ	SQ
		Sample Type		Primary	Trip Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank
Analyte	**Method**	**Units**		**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**
Gasoline Range Organics (C6-C10)	AK101	mg/kg	300	ND [0.41]	5.70 [0.91]	1.50 [0.88]	1.00 [0.88] J	4.60 [0.90]	0.60[0.88] J
Diesel Range Organics (C10-C25)	AK102	mg/kg	250	ND [2.0]	-	-	-	-	-
Residual Range Organics (C25-C36)	AK103	mg/kg	11000	ND [9.9]	-	-	-	-	-
Arsenic	SW6020A	µg/kg	3900	**8800 [140]**	-	-	-	-	-
Barium	SW6020A	µg/kg	1100000	40000 [180]	-	-	-	-	-
Cadmium	SW6020A	µg/kg	5000	59 [23] J	-	-	-	-	-
Chromium	SW6020A	µg/kg	25000	5700 [160]	-	-	-	-	-
Lead	SW6020A	µg/kg	400000	6900 [45]	-	-	-	-	-
Selenium	SW6020A	µg/kg	3400	120 [230] J	-	-	-	-	-
Silver	SW6020A	µg/kg	11200	44 [54] J	-	-	-	-	-
Mercury	SW7471B	µg/kg	1400	ND [15]	-	-	-	-	-
1,1,1,2-Tetrachloroethane	SW8260B	µg/kg	NE	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
1,1,1-Trichloroethane	SW8260B	µg/kg	820	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
1,1,2,2-Tetrachloroethane	SW8260B	µg/kg	17	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
1,1,2-Trichloroethane	SW8260B	µg/kg	18	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
1,1-Dichloroethane	SW8260B	µg/kg	25000	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
1,1-Dichloroethene	SW8260B	µg/kg	30	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
1,1-Dichloropropene	SW8260B	µg/kg	NE	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
1,2,3-Trichlorobenzene	SW8260B	µg/kg	NE	ND [15]	ND [33]	ND [30]	ND [33]	ND [33]	ND [33]
1,2,3-Trichloropropane	SW8260B	µg/kg	0.53	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
1,2,4-Trichlorobenzene	SW8260B	µg/kg	850	ND [10]	12 [22] J	ND [20]	ND [22]	ND [22]	ND [22]
1,2,4-Trimethylbenzene	SW8260B	µg/kg	23000	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
1,2-Dibromo-3-chloropropane	SW8260B	µg/kg	NE	ND [51]	ND [110]	ND [100]	ND [110]	ND [110]	ND [110]
1,2-Dibromoethane	SW8260B	µg/kg	0.16	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
1,2-Dichlorobenzene	SW8260B	µg/kg	5100	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
1,2-Dichloroethane	SW8260B	µg/kg	16	ND [8.1]	ND [18]	ND [16]	ND [17]	ND [18]	ND [17]
1,2-Dichloroethene, Total	SW8260B	µg/kg	NE	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
1,2-Dichloropropane	SW8260B	µg/kg	18	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
1,3,5-Trimethylbenzene	SW8260B	µg/kg	23000	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
1,3-Dichlorobenzene	SW8260B	µg/kg	28000	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
1,3-Dichloropropane	SW8260B	µg/kg	33	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
1,4-Dichlorobenzene	SW8260B	µg/kg	640	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
2,2-Dichloropropane	SW8260B	µg/kg	NE	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
2-Butanone	SW8260B	µg/kg	59000	ND [41]	ND [89]	ND [80]	ND [87]	ND [88]	ND [87]
2-Chlorotoluene	SW8260B	µg/kg	NE	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
2-Hexanone	SW8260B	µg/kg	NE	ND [41]	ND [89]	ND [80]	ND [87]	ND [88]	ND [87]
4-Chlorotoluene	SW8260B	µg/kg	NE	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
4-Isopropyltoluene	SW8260B	µg/kg	NE	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
4-Methyl-2-pentanone	SW8260B	µg/kg	8100	ND [41]	ND [89]	ND [80]	ND [87]	ND [88]	ND [87]
Acetone	SW8260B	µg/kg	88000	ND [100]	ND [220]	ND [200]	ND [220]	ND [220]	ND [220]
Benzene	SW8260B	µg/kg	25	ND [4.1]	ND [8.9]	ND [8.0]	ND [8.7]	ND [8.8]	ND [8.7]
Bromobenzene	SW8260B	µg/kg	NE	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
Bromochloromethane	SW8260B	µg/kg	NE	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
Bromodichloromethane	SW8260B	µg/kg	44	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
Bromoform	SW8260B	µg/kg	340	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
Bromomethane	SW8260B	µg/kg	160	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
Carbon disulfide	SW8260B	µg/kg	12000	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
Carbon tetrachloride	SW8260B	µg/kg	23	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
Chlorobenzene	SW8260B	µg/kg	630	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
Chloroethane	SW8260B	µg/kg	580000	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
Chloroform	SW8260B	µg/kg	460	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
Chloromethane	SW8260B	µg/kg	210	ND [13]	ND [28]	ND [25]	ND [27]	ND [28]	ND [27]
Dibromochloromethane	SW8260B	µg/kg	32	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
Dibromomethane	SW8260B	µg/kg	1100	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
Dichlorodifluoromethane	SW8260B	µg/kg	140000	ND [20]	ND [45]	ND [40]	ND [43]	ND [44]	ND [43]
Ethylbenzene	SW8260B	µg/kg	6900	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
Hexachlorobutadiene	SW8260B	µg/kg	120	ND [10]	22 [22] J	ND [20]	ND [22]	ND [22]	ND [22]
Isopropylbenzene	SW8260B	µg/kg	51000	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
Methyl-tert-butyl ether (MTBE)	SW8260B	µg/kg	1300	ND [51]	ND [110]	ND [100]	ND [110]	ND [110]	ND [110]
Methylene chloride	SW8260B	µg/kg	16	ND [20]	ND [45]	ND [40]	ND [43]	ND [44]	ND [43]
Naphthalene	SW8260B	µg/kg	20000	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
Styrene	SW8260B	µg/kg	960	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
Tetrachloroethene (PCE)	SW8260B	µg/kg	24	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
Toluene	SW8260B	µg/kg	6500	ND [10]	ND [22]	ND [20]	10 [22] J	8.7[22] J,B	ND [22]
Trichloroethene (TCE)	SW8260B	µg/kg	20	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
Trichlorofluoromethane	SW8260B	µg/kg	86000	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
Vinyl chloride	SW8260B	µg/kg	8.5	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]

Table A-4 Subsurface Soil Sample Results
Fire Training Pits Investigation
Fort Wainwright, Alaska

		Sample ID	ADEC Cleanup Level/[1,2] EPA Screening Level[3]	13FWFP57SO	13M27SQ	13M28SQ	13M29SQ	13M30SQ	13M31SQ
		Boring ID		AP-10285	Trip Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank
		Location ID		BH2515	NA	NA	NA	NA	NA
		Laboratory		TADC	TADC	TADC	TADC	TADC	TADC
		Lab Sample ID		48964-17	48825-18	48840-18	48809-8	48971-18	48964-18
		Collect Date		11/04/2013	10/31/2013	10/31/2013	11/01/2013	11/02/2013	11/04/2013
		Matrix		SO	SQ	SQ	SQ	SQ	SQ
		Sample Type		Primary	Trip Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank
Analyte	**Method**	**Units**		**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**
Xylene, Isomers m & p	SW8260B	µg/kg	63000	ND [20]	ND [45]	ND [40]	ND [43]	ND [44]	ND [43]
cis-1,2-Dichloroethene	SW8260B	µg/kg	240	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
cis-1,3-Dichloropropene	SW8260B	µg/kg	33	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
n-Butylbenzene	SW8260B	µg/kg	15000	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
n-Propylbenzene	SW8260B	µg/kg	15000	ND [15]	ND [33]	ND [30]	ND [33]	ND [33]	ND [33]
o-Xylene	SW8260B	µg/kg	63000	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
sec-Butylbenzene	SW8260B	µg/kg	12000	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
tert-Butylbenzene	SW8260B	µg/kg	12000	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
trans-1,2-Dichloroethene	SW8260B	µg/kg	370	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
trans-1,3-Dichloropropene	SW8260B	µg/kg	33	ND [10]	ND [22]	ND [20]	ND [22]	ND [22]	ND [22]
1,2,4-Trichlorobenzene	SW8270D	µg/kg	850	ND [33]	-	-	-	-	-
1,2-Dichlorobenzene	SW8270D	µg/kg	5100	ND [33]	-	-	-	-	-
1,2-Diphenylhydrazine	SW8270D	µg/kg	28000	ND [33]	-	-	-	-	-
1,3-Dichlorobenzene	SW8270D	µg/kg	22000	ND [33]	-	-	-	-	-
1,4-Dichlorobenzene	SW8270D	µg/kg	6200	ND [33]	-	-	-	-	-
2,4,5-Trichlorophenol	SW8270D	µg/kg	67000	ND [130]	-	-	-	-	-
2,4,6-Trichlorophenol	SW8270D	µg/kg	1400	ND [67]	-	-	-	-	-
2,4-Dichlorophenol	SW8270D	µg/kg	1300	ND [67]	-	-	-	-	-
2,4-Dimethylphenol	SW8270D	µg/kg	8800	ND [130]	-	-	-	-	-
2,4-Dinitrophenol	SW8270D	µg/kg	540	ND [680]	-	-	-	-	-
2,4-Dinitrotoluene	SW8270D	µg/kg	9.3	ND [130]	-	-	-	-	-
2,6-Dichlorophenol	SW8270D	µg/kg	NE	ND [130]	-	-	-	-	-
2,6-Dinitrotoluene	SW8270D	µg/kg	9.4	ND [67]	-	-	-	-	-
2-Chloronaphthalene	SW8270D	µg/kg	120000	ND [33]	-	-	-	-	-
2-Chlorophenol	SW8270D	µg/kg	1500	ND [33]	-	-	-	-	-
2-Methyl-4,6-dinitrophenol	SW8270D	µg/kg	NE	ND [670]	-	-	-	-	-
2-Methylnaphthalene	SW8270D	µg/kg	6100	ND [33]	-	-	-	-	-
2-Methylphenol (o-Cresol)	SW8270D	µg/kg	15000	ND [33]	-	-	-	-	-
2-Nitroaniline	SW8270D	µg/kg	NE	ND [67]	-	-	-	-	-
2-Nitrophenol	SW8270D	µg/kg	NE	ND [67]	-	-	-	-	-
3,3'-Dichlorobenzidine	SW8270D	µg/kg	190	ND [330]	-	-	-	-	-
3-Methylphenol/4-Methylphenol Coelution	SW8270D	µg/kg	1500	ND [67]	-	-	-	-	-
3-Nitroaniline	SW8270D	µg/kg	NE	ND [130]	-	-	-	-	-
4-Bromophenyl phenyl ether	SW8270D	µg/kg	NE	ND [33]	-	-	-	-	-
4-Chloro-3-methylphenol	SW8270D	µg/kg	NE	ND [130]	-	-	-	-	-
4-Chloroaniline	SW8270D	µg/kg	57	ND [130]	-	-	-	-	-
4-Chlorophenyl phenyl ether	SW8270D	µg/kg	NE	ND [67]	-	-	-	-	-
4-Nitroaniline	SW8270D	µg/kg	NE	ND [130]	-	-	-	-	-
4-Nitrophenol	SW8270D	µg/kg	NE	ND [330]	-	-	-	-	-
Acenaphthene	SW8270D	µg/kg	180000	ND [17]	-	-	-	-	-
Acenaphthylene	SW8270D	µg/kg	180000	ND [33]	-	-	-	-	-
Anthracene	SW8270D	µg/kg	3000000	ND [33]	-	-	-	-	-
Benzidine	SW8270D	µg/kg	NE	ND [4000]	-	-	-	-	-
Benzo(a)anthracene	SW8270D	µg/kg	3600	ND [33]	-	-	-	-	-
Benzo(a)pyrene	SW8270D	µg/kg	2100	ND [33]	-	-	-	-	-
Benzo(b)fluoranthene	SW8270D	µg/kg	12000	ND [33]	-	-	-	-	-
Benzo(g,h,i)perylene	SW8270D	µg/kg	38700000	ND [33]	-	-	-	-	-
Benzo(k)fluoranthene	SW8270D	µg/kg	120000	ND [67]	-	-	-	-	-
Benzoic acid	SW8270D	µg/kg	410000	ND [670]	-	-	-	-	-
Benzyl alcohol	SW8270D	µg/kg	NE	ND [33]	-	-	-	-	-
Benzyl butyl phthalate	SW8270D	µg/kg	920000	ND [67]	-	-	-	-	-
Carbazole	SW8270D	µg/kg	6500	ND [68]	-	-	-	-	-
Chrysene	SW8270D	µg/kg	360000	ND [33]	-	-	-	-	-
Di-n-butyl phthalate	SW8270D	µg/kg	80000	ND [33]	-	-	-	-	-
Di-n-octyl phthalate	SW8270D	µg/kg	3800000	ND [67]	-	-	-	-	-
Dibenzo(a,h)anthracene	SW8270D	µg/kg	4000	ND [33]	-	-	-	-	-
Dibenzofuran	SW8270D	µg/kg	11000	ND [33]	-	-	-	-	-
Diethyl phthalate	SW8270D	µg/kg	130000	ND [33]	-	-	-	-	-
Dimethyl phthalate	SW8270D	µg/kg	1100000	ND [33]	-	-	-	-	-
Fluoranthene	SW8270D	µg/kg	1400000	ND [67]	-	-	-	-	-
Fluorene	SW8270D	µg/kg	220000	ND [33]	-	-	-	-	-
Hexachlorobenzene	SW8270D	µg/kg	47	ND [67]	-	-	-	-	-
Hexachlorobutadiene	SW8270D	µg/kg	120	ND [67]	-	-	-	-	-
Hexachloroethane	SW8270D	µg/kg	210	ND [33]	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	SW8270D	µg/kg	41000	ND [33]	-	-	-	-	-
Isophorone	SW8270D	µg/kg	3100	ND [33]	-	-	-	-	-
Naphthalene	SW8270D	µg/kg	20000	ND [67]	-	-	-	-	-
Nitrobenzene	SW8270D	µg/kg	94	ND [33]	-	-	-	-	-

Table A-4 Subsurface Soil Sample Results
Fire Training Pits Investigation
Fort Wainwright, Alaska

			ADEC Cleanup Level/ [1,2] EPA Screening Level[3]						
Sample ID				13FWFP57SO	13M27SQ	13M28SQ	13M29SQ	13M30SQ	13M31SQ
Boring ID				AP-10285	Trip Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank
Location ID				BH2515	NA	NA	NA	NA	NA
Laboratory				TADC	TADC	TADC	TADC	TADC	TADC
Lab Sample ID				48964-17	48825-18	48840-18	48809-8	48971-18	48964-18
Collect Date				11/04/2013	10/31/2013	10/31/2013	11/01/2013	11/02/2013	11/04/2013
Matrix				SO	SQ	SQ	SQ	SQ	SQ
Sample Type				Primary	Trip Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank
Analyte	**Method**	**Units**		**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**
Pentachlorophenol	SW8270D	µg/kg	47	ND [680]	-	-	-	-	-
Phenanthrene	SW8270D	µg/kg	3000000	ND [33]	-	-	-	-	-
Phenol	SW8270D	µg/kg	68000	ND [33]	-	-	-	-	-
Pyrene	SW8270D	µg/kg	1000000	ND [33]	-	-	-	-	-
bis(2-Chloroisopropyl)ether	SW8270D	µg/kg	NE	ND [33]	-	-	-	-	-
bis-(2-Chloroethoxy)methane	SW8270D	µg/kg	NE	ND [67]	-	-	-	-	-
bis-(2-Chloroethyl)ether	SW8270D	µg/kg	2.2	ND [33]	-	-	-	-	-
bis-(2-Ethylhexyl)phthalate	SW8270D	µg/kg	13000	ND [67]	-	-	-	-	-
n-Nitrosodi-n-propylamine	SW8270D	µg/kg	1.1	ND [67]	-	-	-	-	-
n-Nitrosodimethylamine	SW8270D	µg/kg	0.053	ND [67]	-	-	-	-	-
n-Nitrosodiphenylamine	SW8270D	µg/kg	15000	ND [33]	-	-	-	-	-
n-Nitrosopyrrolidine	SW8270D	µg/kg	NE	ND [130]	-	-	-	-	-
4,4'-DDD	SW8081B	µg/kg	7200	ND [0.70]	-	-	-	-	-
4,4'-DDE	SW8081B	µg/kg	5100	ND [0.47]	-	-	-	-	-
4,4'-DDT	SW8081B	µg/kg	7300	ND [0.70]	-	-	-	-	-
Aldrin	SW8081B	µg/kg	70	ND [0.47]	-	-	-	-	-
alpha-BHC	SW8081B	µg/kg	6.4	ND [0.47]	-	-	-	-	-
alpha-Chlordane	SW8081B	µg/kg	2300	ND [0.47]	-	-	-	-	-
beta-BHC	SW8081B	µg/kg	22	ND [0.47]	-	-	-	-	-
delta-BHC	SW8081B	µg/kg	NE	ND [0.47]	-	-	-	-	-
Dieldrin	SW8081B	µg/kg	7.6	ND [0.47]	-	-	-	-	-
Endosulfan I	SW8081B	µg/kg	64000	ND [0.47]	-	-	-	-	-
Endosulfan II	SW8081B	µg/kg	64000	ND [0.70]	-	-	-	-	-
Endosulfan sulfate	SW8081B	µg/kg	NE	ND [0.47]	-	-	-	-	-
Endrin	SW8081B	µg/kg	290	ND [0.70]	-	-	-	-	-
Endrin aldehyde	SW8081B	µg/kg	NE	ND [0.70]	-	-	-	-	-
Endrin ketone	SW8081B	µg/kg	NE	ND [27]	-	-	-	-	-
gamma-BHC (Lindane)	SW8081B	µg/kg	9.5	ND [0.47]	-	-	-	-	-
gamma-Chlordane	SW8081B	µg/kg	2300	ND [0.47]	-	-	-	-	-
Heptachlor	SW8081B	µg/kg	280	ND [0.70]	-	-	-	-	-
Heptachlor epoxide	SW8081B	µg/kg	14	ND [0.70]	-	-	-	-	-
Methoxychlor	SW8081B	µg/kg	23000	ND [0.70]	-	-	-	-	-
Toxaphene	SW8081B	µg/kg	3900	ND [0.70]	-	-	-	-	-
PCB-1016 (Aroclor 1016)	SW8082A	µg/kg		ND [10]	-	-	-	-	-
PCB-1221 (Aroclor 1221)	SW8082A	µg/kg		ND [20]	-	-	-	-	-
PCB-1232 (Aroclor 1232)	SW8082A	µg/kg		ND [15]	-	-	-	-	-
PCB-1242 (Aroclor 1242)	SW8082A	µg/kg	1000	ND [10]	-	-	-	-	-
PCB-1248 (Aroclor 1248)	SW8082A	µg/kg		ND [10]	-	-	-	-	-
PCB-1254 (Aroclor 1254)	SW8082A	µg/kg		ND [10]	-	-	-	-	-
PCB-1260 (Aroclor 1260)	SW8082A	µg/kg		ND [10]	-	-	-	-	-
Perfluorobutane Sulfonate (PFBS)	DVLC012	µg/kg	NE	ND [0.59]	-	-	-	-	-
Perfluorobutyric acid (PFBTA)	DVLC012	µg/kg	NE	ND [0.59]	-	-	-	-	-
Perfluorodecane Sulfonate (PFDCS)	DVLC012	µg/kg	NE	ND [0.59]	-	-	-	-	-
Perfluorododecanoic acid (PFDOA)	DVLC012	µg/kg	NE	ND [0.59]	-	-	-	-	-
Perfluorohexanoic acid (PFHA)	DVLC012	µg/kg	NE	ND [0.59]	-	-	-	-	-
Perfluoroheptanoic acid (PFHPA)	DVLC012	µg/kg	NE	ND [0.59]	-	-	-	-	-
Perfluorohexane Sulfonate (PFHXS)	DVLC012	µg/kg	NE	ND [0.59]	-	-	-	-	-
Perfluorononanoic acid (PFNA)	DVLC012	µg/kg	NE	ND [0.59]	-	-	-	-	-
Perfluorodecanoic acid (PFNDCA)	DVLC012	µg/kg	NE	ND [0.59]	-	-	-	-	-
Perfluorooctanoic acid (PFOA)	DVLC012	µg/kg	142 / 2030 [2] (16000)[3]	ND [0.59]	-	-	-	-	-
Perfluorooctane Sulfonate (PFOS)	DVLC012	µg/kg	571 / 3040 [2] (6000)[3]	ND [0.59]	-	-	-	-	-
Perfluorooctane Sulfonamide (PFOSA)	DVLC012	µg/kg	NE	ND [0.59]	-	-	-	-	-
Perfluoropentanoic acid (PFPA)	DVLC012	µg/kg	NE	ND [0.59]	-	-	-	-	-
Perfluorotetradecanoic acid (PFTEDA)	DVLC012	µg/kg	NE	ND [0.59]	-	-	-	-	-
Perfluorotridecanoic acid (PFTRIDA)	DVLC012	µg/kg	NE	ND [0.59]	-	-	-	-	-
Perfluoroundecanoic acid (PFUNDCA)	DVLC012	µg/kg	NE	ND [0.59]	-	-	-	-	-
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpC	SW8290A	pg/g	NE	ND [0.028]	-	-	-	-	-
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxins-C13	SW8290A	pg/g	NE	79 [0]	-	-	-	-	-
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	SW8290A	pg/g	NE	0.34[0.027] J,B	-	-	-	-	-
1,2,3,4,6,7,8-Heptachlorodibenzofurans-C13	SW8290A	pg/g	NE	71 [0]	-	-	-	-	-
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	SW8290A	pg/g	NE	ND [0.032]	-	-	-	-	-
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD	SW8290A	pg/g	NE	ND [0.025]	-	-	-	-	-
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	SW8290A	pg/g	NE	0.069[0.024] J,B	-	-	-	-	-
1,2,3,4,7,8-Hexachlorodibenzofuran-C13	SW8290A	pg/g	NE	64 [0]	-	-	-	-	-

Table A-4 Subsurface Soil Sample Results
Fire Training Pits Investigation
Fort Wainwright, Alaska

			ADEC Cleanup Level/ [1,2] EPA Screening Level[3]	13FWFP57SO	13M27SQ	13M28SQ	13M29SQ	13M30SQ	13M31SQ
Boring ID				AP-10285	Trip Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank
Location ID				BH2515	NA	NA	NA	NA	NA
Laboratory				TADC	TADC	TADC	TADC	TADC	TADC
Lab Sample ID				48964-17	48825-18	48840-18	48809-8	48971-18	48964-18
Collect Date				11/04/2013	10/31/2013	10/31/2013	11/01/2013	11/02/2013	11/04/2013
Matrix				SO	SQ	SQ	SQ	SQ	SQ
Sample Type				Primary	Trip Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank
Analyte	**Method**	**Units**		**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**	**Result[LOD] Qualifier**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD	SW8290A	pg/g	NE	ND [0.018]	-	-	-	-	-
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin-C13	SW8290A	pg/g	NE	66 [0]	-	-	-	-	-
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	SW8290A	pg/g	NE	0.029[0.018] J	-	-	-	-	-
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD	SW8290A	pg/g	NE	ND [0.018]	-	-	-	-	-
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	SW8290A	pg/g	NE	ND [0.023]	-	-	-	-	-
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	SW8290A	pg/g	NE	ND [0.031]	-	-	-	-	-
1,2,3,7,8-Pentachlorodibenzo-p-dioxin-C13	SW8290A	pg/g	NE	62 [0]	-	-	-	-	-
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	SW8290A	pg/g	NE	ND [0.029]	-	-	-	-	-
1,2,3,7,8-Pentachlorodibenzofurans-C13	SW8290A	pg/g	NE	60 [0]	-	-	-	-	-
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	SW8290A	pg/g	NE	ND [0.021]	-	-	-	-	-
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	SW8290A	pg/g	NE	ND [0.030]	-	-	-	-	-
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	SW8290A	pg/g	47	ND [0.028]	-	-	-	-	-
2,3,7,8-Tetrachlorodibenzo-p-dioxin-C13	SW8290A	pg/g	NE	64 [0]	-	-	-	-	-
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	SW8290A	pg/g	NE	ND [0.022]	-	-	-	-	-
2,3,7,8-Tetrachlorodibenzofuran-C13	SW8290A	pg/g	NE	57 [0]	-	-	-	-	-
Octachlorodibenzo-p-dioxin (OCDD)	SW8290A	pg/g	NE	0.35[0.035] J,B	-	-	-	-	-
Octachlorodibenzo-p-dioxin-C13	SW8290A	pg/g	NE	77 [0]	-	-	-	-	-
Octachlorodibenzofuran (OCDF)	SW8290A	pg/g	NE	0.33[0.045] J,B	-	-	-	-	-
Total Heptachlorodibenzo-p-dioxins (HpCDD)	SW8290A	pg/g	NE	0.091[0.028] J,B	-	-	-	-	-
Total Heptachlorodibenzofurans (HpCDF)	SW8290A	pg/g	NE	0.34[0.029] J,B	-	-	-	-	-
Total Hexachlorodibenzo-p-dioxins (HxCDD)	SW8290A	pg/g	NE	ND [0.078]	-	-	-	-	-
Total Hexachlorodibenzofurans (HxCDF)	SW8290A	pg/g	NE	0.16[0.021] J,B	-	-	-	-	-
Total Pentachlorodibenzo-p-dioxin (PeCDD)	SW8290A	pg/g	NE	ND [0.031]	-	-	-	-	-
Total Pentachlorodibenzofurans (PeCDF)	SW8290A	pg/g	NE	ND [0.030]	-	-	-	-	-
Total Tetrachlorodibenzo-p-dioxins (TCDD)	SW8290A	pg/g	NE	0.23[0.028] J	-	-	-	-	-
Total Tetrachlorodibenzofurans (TCDF)	SW8290A	pg/g	NE	0.093[0.022] J	-	-	-	-	-
Total Dioxin/Furan TEQ	SW8290A	pg/g	47 [4,5]	0.013	-	-	-	-	-

Yellow highlighted and **bolded** results exceed ADEC soil cleanup levels (most stringent pathway).
Green highlighted results exceed ADEC's proposed migration to groundwater cleanup level (applies to PFOA or PFOS only).
Grey highlighted results are non-detect with LODs above cleanup levels.

[1] Cleanup levels are from ADEC Title 18, Alaska Administrative Code, Section 75.341, Tables B1 and B2 (ADEC, 2012).

[2] Proposed cleanup levels for PFOA and PFOS (migration to groundwater / human health) are from the Public Comment Draft of 18 AAC 75 dated August 26, 2015.

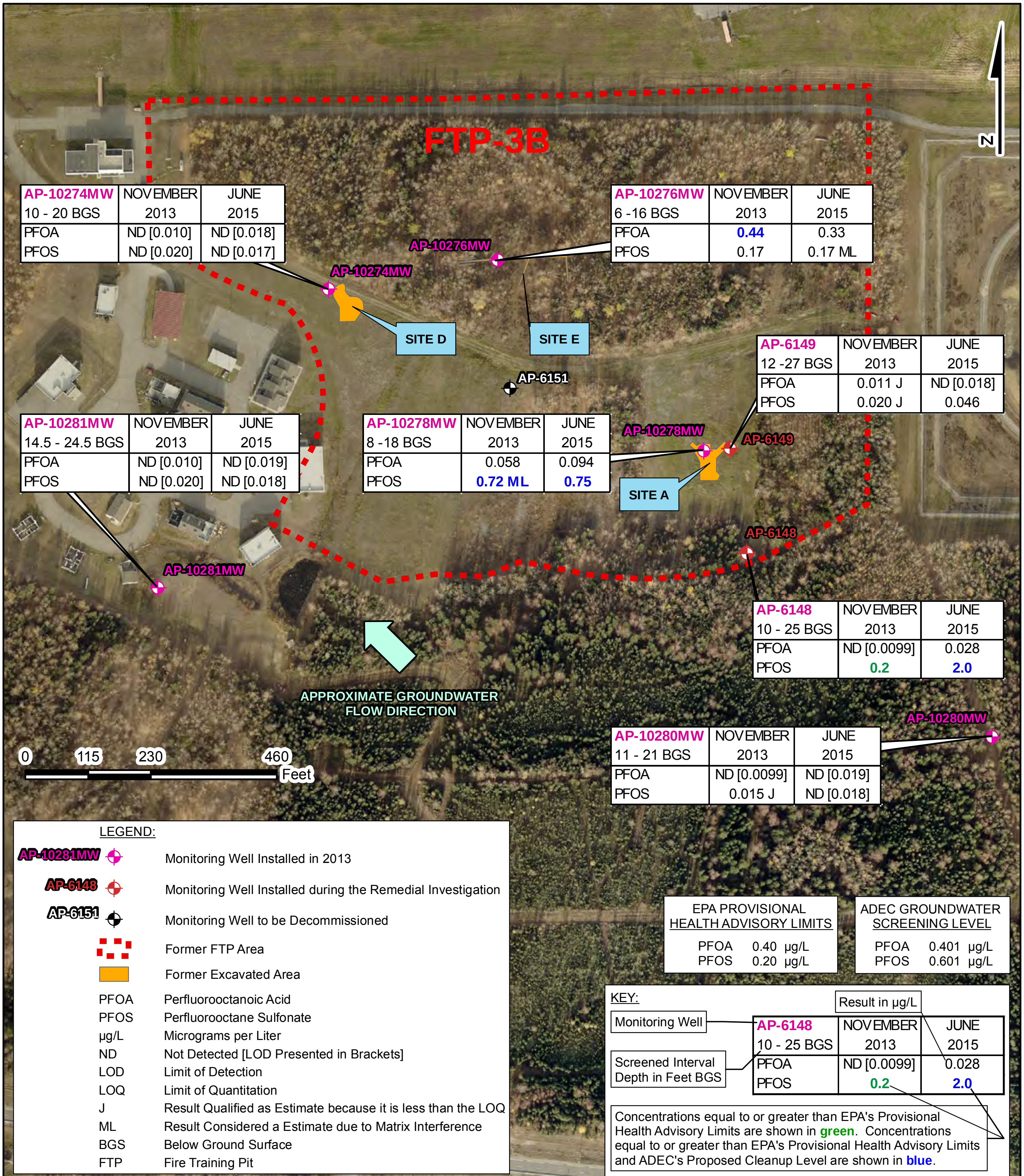
[3] EPA Region 4 Residential Soil Screening Levels from "Soil Screening Levels for Perfluorooctanoic Acid (PFOA) and Perfluorooctyl Sulfonate (PFOS)"

[4] Total TEQs are presented for each sample (none of which exceed the ADEC cleanup level). Analyte-specific TEQs are presented in the associated laboratory reports. Total TEQ = $\Sigma(C_i * TEF_i)$

[5] TEFs (used to calculate TEQs) are established from the World Health Organization (WHO, 2005).

LOD - limit of detection
LOQ - limit of quantitation
μg/kg - micrograms per kilogram
mg/kg - milligrams per kilogram
NA - not applicable
NE - not established
PFC - perfluorinated compounds
pg/g - picograms per gram
QC - quality control
SO - subsurface soil matrix
SQ - soil QC
TADC - TestAmerica Laboratories of Denver, CO
TEF - toxicity equivalency factor
TEQ - toxicity equivalence, where Total TEQ = $\Sigma(C_i * TEF_i)$

Data Qualifiers:
B - result may be due to cross-contamination
J - result qualified as estimate because it is less than the LOQ
M - result considered an estimate (L - low; H - high) due to matrix interference
ND - non-detect (LOD in parentheses)
Q - result considered an estimate (L - low; H - high) due to a QC failure
R - result rejected due to QC issue



AP-10274MW	NOVEMBER	JUNE
10 - 20 BGS	2013	2015
PFOA	ND [0.010]	ND [0.018]
PFOS	ND [0.020]	ND [0.017]

AP-10276MW	NOVEMBER	JUNE
6 -16 BGS	2013	2015
PFOA	**0.44**	0.33
PFOS	0.17	0.17 ML

AP-6149	NOVEMBER	JUNE
12 -27 BGS	2013	2015
PFOA	0.011 J	ND [0.018]
PFOS	0.020 J	0.046

AP-10281MW	NOVEMBER	JUNE
14.5 - 24.5 BGS	2013	2015
PFOA	ND [0.010]	ND [0.019]
PFOS	ND [0.020]	ND [0.018]

AP-10278MW	NOVEMBER	JUNE
8 -18 BGS	2013	2015
PFOA	0.058	0.094
PFOS	**0.72 ML**	**0.75**

AP-6148	NOVEMBER	JUNE
10 - 25 BGS	2013	2015
PFOA	ND [0.0099]	0.028
PFOS	**0.2**	**2.0**

AP-10280MW	NOVEMBER	JUNE
11 - 21 BGS	2013	2015
PFOA	ND [0.0099]	ND [0.019]
PFOS	0.015 J	ND [0.018]

LEGEND:

AP-10281MW Monitoring Well Installed in 2013

AP-6148 Monitoring Well Installed during the Remedial Investigation

AP-6151 Monitoring Well to be Decommissioned

Former FTP Area

Former Excavated Area

PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
µg/L	Micrograms per Liter
ND	Not Detected [LOD Presented in Brackets]
LOD	Limit of Detection
LOQ	Limit of Quantitation
J	Result Qualified as Estimate because it is less than the LOQ
ML	Result Considered a Estimate due to Matrix Interference
BGS	Below Ground Surface
FTP	Fire Training Pit

EPA PROVISIONAL HEALTH ADVISORY LIMITS

PFOA 0.40 µg/L
PFOS 0.20 µg/L

ADEC GROUNDWATER SCREENING LEVEL

PFOA 0.401 µg/L
PFOS 0.601 µg/L

KEY:

Monitoring Well — Result in µg/L — Screened Interval Depth in Feet BGS

AP-6148	NOVEMBER	JUNE
10 - 25 BGS	2013	2015
PFOA	ND [0.0099]	0.028
PFOS	**0.2**	**2.0**

Concentrations equal to or greater than EPA's Provisional Health Advisory Limits are shown in **green**. Concentrations equal to or greater than EPA's Provisional Health Advisory Limits and ADEC's Proposed Cleanup Level are shown in **blue**.

NOTES:

1. The proposed ADEC cleanup levels are from the Public Comment Draft of the revision to 18 AAC 75, Oil and Other Hazardous Substances Pollution Control (ADEC, 2015)

2. EPA Provisional Health Advisory levels from "Provisional Health Advisories for Perfluorooctanaoic Acid (PFOA) and Perfluorooctyl Sulfonate (PFOS)." (EPA, 2009a).

3. * A sample was not collected from AP-6151 because the well was broken below ground surface.

4. Coordinate System - Projection: World Geodetic System of 1984 (WGS84) Universal Transverse Mercator (UTM), Zone 6N, Meters

5. Aerial imagery obtained from Department of Public Works (DPW) Environmental, 2014

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

PFOA and PFOS Concentrations in FTP-3B Groundwater Samples

Fire Training Pits Investigation
Fort Wainwright, Alaska

Contract: W911KB-12-D-0001 | Figure: 4-4 | Date: 1/16

Table A-6 - 2015 Groundwater Sample Results
Fire Training Pit
Fort Wainwright, Alaska

Sample ID			Cleanup Level / Advisory Level[1,2]	15FWFP01WG	15FWFP02WG	15FWFP03WG	15FWFP04WG	15FWFP05WG	15FWFP06WG	15FWFP07WG	15FWFP08WG	15FWFP09WG	15FWFP10WG	15FWFP11WG	15FWFP12WG	15FWFP13WG	15FWFP14WG	15FWFP15WG	15FWFP16WQ
Location ID				AP-10280MW	AP-6149	AP-6148	AP-10278MW	AP-10276MW	AP-10276MW	AP-10274MW	AP-10281MW	AP-10261MW	AP-10267MW	AP-10267MW	AP-10285MW	AP-10266MW	AP-10283MW	AP-10265MW	TRIP BLANK
Sample Data Group				280-70727-1	280-70727-1	280-70727-1	280-70727-1	280-70727-1	280-70727-1	280-70727-1	280-70727-1	280-70727-1	280-70727-1	280-70727-1	280-70727-1	280-70727-1	280-70727-1	280-70727-1	280-70727-1
Laboratory ID				70727-1	70727-2	70727-3	70727-4	70727-5	70727-6	70727-7	70727-8	70727-9	70727-10	70727-11	70727-12	70727-13	70727-14	70727-15	70727-16
Collection Date				6/9/2015	6/9/2015	6/9/2015	6/9/2015	6/9/2015	6/9/2015	6/9/2015	6/10/2015	6/10/2015	6/10/2015	6/10/2015	6/10/2015	6/10/2015	6/11/2015	6/11/2015	6/9/2015
Matirx				WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WQ
Sample Type				Primary	Primary	Primary	Primary	Primary/MS/MSD	Field Duplicate	Primary	Primary	Primary	Primary/MS/MSD	Field Duplicate	Primary	Primary	Primary	Primary	Trip Blank
Analyte	**Method**	**Units**		**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
Gasoline Range Organics (C6-C10)	AK101	mg/L	2.2	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]
Diesel Range Organics (C10-C25)	AK102	mg/L	1.5	ND [0.13]	ND [0.12]	0.075 [0.13] J	0.11 [0.13] J	0.12 [0.12] J	0.11 [0.12] J	ND [0.12]	ND [0.13]	ND [0.12]	ND [0.13]	ND [0.12]	ND [0.12]	0.14 [0.13] J	ND [0.12]	ND [0.12]	-
Residual Range Organics (C25-C36)	AK103	mg/L	1.1	ND [0.14]	ND [0.13]	ND [0.13]	ND [0.13]	ND [0.13]	ND [0.13]	ND [0.13]	ND [0.13]	ND [0.13]	ND [0.13]	ND [0.13]	ND [0.13]	0.078 [0.13] J	ND [0.13]	ND [0.13]	-
1,1,1,2-Tetrachloroethane	SW8260B	µg/L	NE	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]
1,1,1-Trichloroethane	SW8260B	µg/L	200	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
1,1,2,2-Tetrachloroethane	SW8260B	µg/L	4.30	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]
1,1,2-Trichloroethane	SW8260B	µg/L	5	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]
1,1-Dichloroethane	SW8260B	µg/L	7,300	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]
1,1-Dichloroethene	SW8260B	µg/L	7	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]
1,1-Dichloropropene	SW8260B	µg/L	NE	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
1,2,3-Trichlorobenzene	SW8260B	µg/L	NE	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]
1,2,3-Trichloropropane	SW8260B	µg/L	0.12	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]
1,2,4-Trichlorobenzene	SW8260B	µg/L	70	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]
1,2,4-Trimethylbenzene	SW8260B	µg/L	1,800	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
1,2-Dibromo-3-chloropropane	SW8260B	µg/L	NE	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]
1,2-Dibromoethane	SW8260B	µg/L	0.05	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
1,2-Dichlorobenzene	SW8260B	µg/L	600	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
1,2-Dichloroethane	SW8260B	µg/L	5	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
1,2-Dichloroethene, Total	SW8260B	µg/L	NE	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	2 [0.2]	1.9 [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
1,2-Dichloropropane	SW8260B	µg/L	5	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
1,3,5-Trimethylbenzene	SW8260B	µg/L	1,800	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
1,3-Dichlorobenzene	SW8260B	µg/L	3,300	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
1,3-Dichloropropane	SW8260B	µg/L	8.5	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8] ML	ND [0.8] ML	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]
1,4-Dichlorobenzene	SW8260B	µg/L	75	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
2,2-Dichloropropane	SW8260B	µg/L	NE	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
2-Butanone	SW8260B	µg/L	22,000	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]
2-Chlorotoluene	SW8260B	µg/L	NE	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
2-Hexanone	SW8260B	µg/L	NE	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]	ND [4]
4-Chlorotoluene	SW8260B	µg/L	NE	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]
4-Isopropyltoluene	SW8260B	µg/L	NE	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
4-Methyl-2-pentanone	SW8260B	µg/L	2,900	ND [3.2]	ND [3.2]	ND [3.2]	ND [3.2]	ND [3.2]	ND [3.2]	ND [3.2]	ND [3.2]	ND [3.2]	ND [3.2]	ND [3.2]	ND [3.2]	ND [3.2]	ND [3.2]	ND [3.2]	ND [3.2]
Acetone	SW8260B	µg/L	33,000	ND [6.4]	ND [6.4]	ND [6.4]	ND [6.4]	ND [6.4]	ND [6.4]	ND [6.4]	ND [6.4]	ND [6.4]	ND [6.4]	ND [6.4]	ND [6.4]	ND [6.4]	ND [6.4]	ND [6.4]	ND [6.4]
Benzene	SW8260B	µg/L	5	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
Bromobenzene	SW8260B	µg/L	NE	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
Bromochloromethane	SW8260B	µg/L	NE	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
Bromodichloromethane	SW8260B	µg/L	14	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
Bromoform	SW8260B	µg/L	110	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
Bromomethane	SW8260B	µg/L	51	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]
Carbon disulfide	SW8260B	µg/L	3,700	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]
Carbon tetrachloride	SW8260B	µg/L	5	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
Chlorobenzene	SW8260B	µg/L	100	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
Chloroethane	SW8260B	µg/L	290	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]	ND [1.6]
Chloroform	SW8260B	µg/L	140	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
Chloromethane	SW8260B	µg/L	66	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]
cis-1,2-Dichloroethene	SW8260B	µg/L	70	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	1.1 [0.4]	1.1 [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
cis-1,3-Dichloropropene	SW8260B	µg/L	8.5	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
Dibromochloromethane	SW8260B	µg/L	10	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
Dibromomethane	SW8260B	µg/L	370	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
Dichlorodifluoromethane	SW8260B	µg/L	7,300	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]
Ethylbenzene	SW8260B	µg/L	700	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
Hexachlorobutadiene	SW8260B	µg/L	7.3	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]
Isopropylbenzene	SW8260B	µg/L	3,700	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
Methylene chloride	SW8260B	µg/L	5	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]
Methyl-tert-butyl ether (MTBE)	SW8260B	µg/L	470	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]
Naphthalene	SW8260B	µg/L	730	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]
n-Butylbenzene	SW8260B	µg/L	370	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]
n-Propylbenzene	SW8260B	µg/L	370	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
o-Xylene	SW8260B	µg/L	10,000	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
sec-Butylbenzene	SW8260B	µg/L	370	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
Styrene	SW8260B	µg/L	100	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]

Table A-6 - 2015 Groundwater Sample Results
Fire Training Pit
Fort Wainwright, Alaska

		Sample ID	Cleanup Level / Advisory Level[1,2]	15FWFP01WG	15FWFP02WG	15FWFP03WG	15FWFP04WG	15FWFP05WG	15FWFP06WG	15FWFP07WG	15FWFP08WG	15FWFP09WG	15FWFP10WG	15FWFP11WG	15FWFP12WG	15FWFP13WG	15FWFP14WG	15FWFP15WG	15FWFP16WQ
		Location ID		AP-10280MW	AP-6149	AP-6148	AP-10278MW	AP-10276MW	AP-10276MW	AP-10274MW	AP-10281MW	AP-10261MW	AP-10267MW	AP-10267MW	AP-10285MW	AP-10266MW	AP-10283MW	AP-10265MW	TRIP BLANK
		Sample Data Group		280-70727-1	280-70727-1	280-70727-1	280-70727-1	280-70727-1	280-70727-1	280-70727-1	280-70727-1	280-70727-1	280-70727-1	280-70727-1	280-70727-1	280-70727-1	280-70727-1	280-70727-1	280-70727-1
		Laboratory ID		70727-1	70727-2	70727-3	70727-4	70727-5	70727-6	70727-7	70727-8	70727-9	70727-10	70727-11	70727-12	70727-13	70727-14	70727-15	70727-16
		Collection Date		6/9/2015	6/9/2015	6/9/2015	6/9/2015	6/9/2015	6/9/2015	6/9/2015	6/10/2015	6/10/2015	6/10/2015	6/10/2015	6/10/2015	6/10/2015	6/11/2015	6/11/2015	6/9/2015
		Matirx		WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WQ
		Sample Type		Primary	Primary	Primary	Primary	Primary/MS/MSD	Field Duplicate	Primary	Primary	Primary	Primary/MS/MSD	Field Duplicate	Primary	Primary	Primary	Primary	Trip Blank
Analyte	**Method**	**Units**		**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
tert-Butylbenzene	SW8260B	µg/L	370	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
Tetrachloroethene (PCE)	SW8260B	µg/L	5	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
Toluene	SW8260B	µg/L	1,000	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
trans-1,2-Dichloroethene	SW8260B	µg/L	100	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	0.94 [0.4] J	0.84 [0.4] J	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
trans-1,3-Dichloropropene	SW8260B	µg/L	8.5	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]
Trichloroethene (TCE)	SW8260B	µg/L	5	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	0.58 [0.4] J	0.63 [0.4] J	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	ND [0.4]	0.29 [0.4] J	0.34 [0.4] J	ND [0.4]	ND [0.4]
Trichlorofluoromethane	SW8260B	µg/L	11,000	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]
Vinyl chloride	SW8260B	µg/L	2	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
Xylene, Isomers m & p	SW8260B	µg/L	10,000	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]	ND [0.8]
Perfluorooctanoic acid (PFOA)	DVLC012	µg/L	0.401 (0.4)[2]	ND [0.019]	ND [0.018]	0.028 [0.018]	0.094 [0.019]	0.33 [0.019]	0.29 [0.019]	ND [0.018]	ND [0.019]	ND [0.019]	0.064 [0.019]	0.064 [0.019]	ND [0.019]	**0.40 [0.018]**	0.053 [0.019]	0.014 [0.018] J	-
Perfluorooctane Sulfonate (PFOS)	DVLC012	µg/L	0.601 (0.2)[2]	ND [0.018]	0.046 [0.017]	**2.0 [0.07]**	**0.75 [0.018]**	0.17 [0.018] ML	0.13 [0.018] ML	ND [0.017]	ND [0.018]	ND [0.018]	ND [0.018]	ND [0.018]	0.017 [0.018] J	**0.74 [0.017]**	ND [0.018]	ND [0.018]	-

Yellow highlighted results exceed groundwater cleanup levels.
Green highlighted results meet or exceed EPA's Provisional Health Advisory Level.
Blue highlighted results exceed EPA's Provisional Health Advisory Level and ADEC's Proposed Cleanup Level.
Grey highlighted results are non-detect with LODs above cleanup levels.

[1] Cleanup levels were established from ADEC Title 18, Alaska Administrative Code, Section 75.345, Table C (ADEC, 2015). Proposed PFOA and PFOS cleanup levels are from the Public Comment Draft of 18 AAC 75 dated August 26, 2015.

[2] EPA Provisional Health Advisory levels (shown in parentheses) are from "Provisional Health Advisories for Perfluorooctanoic Acid (PFOA) and Perfluorooctyl Sulfonate (PFOS)" (EPA, 2009a).

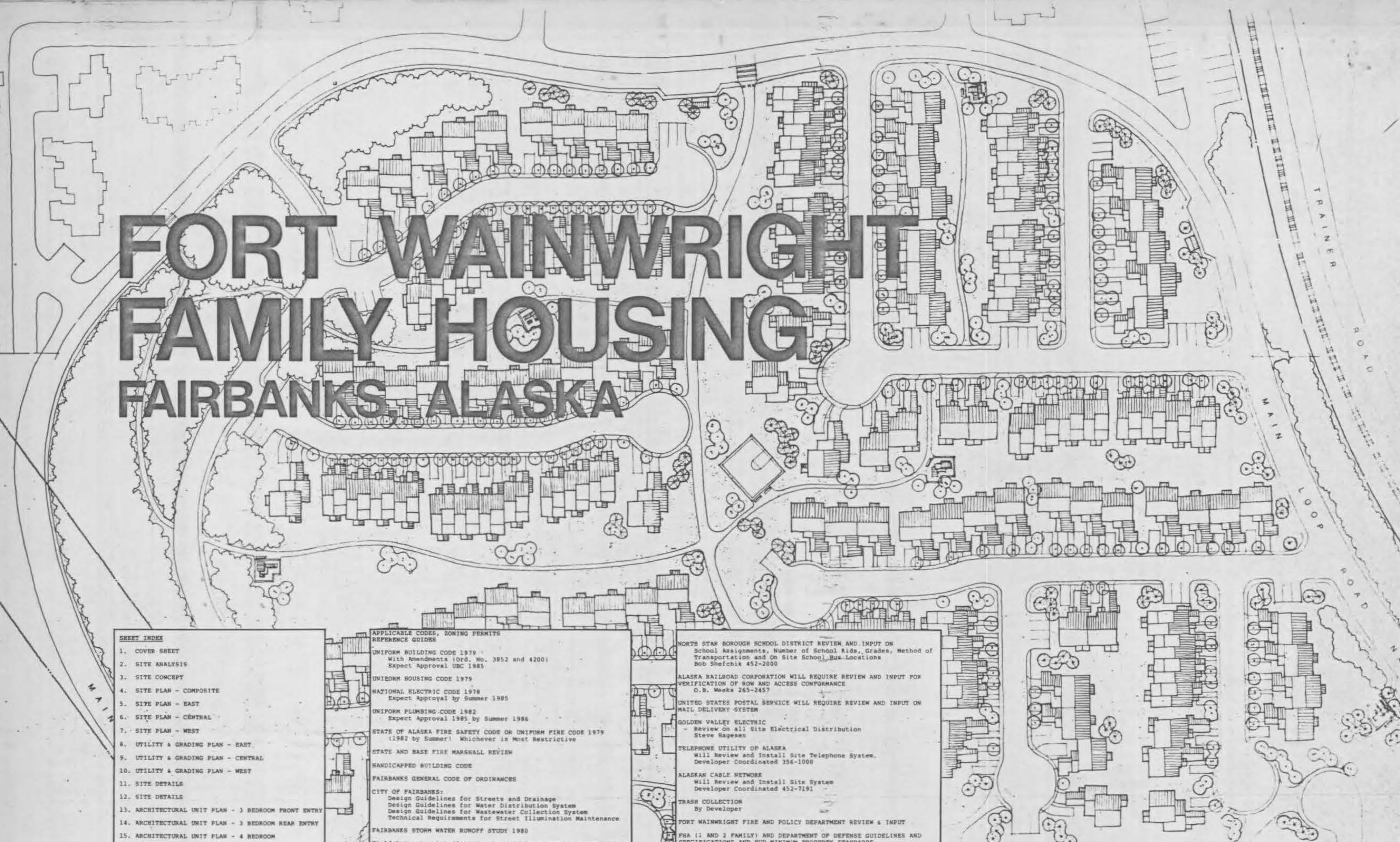
LOD - limit of detection
LOQ - limit of quantitation
µg/L - micrograms per liter
mg/L - milligrams per liter
NE - not established
PFOA - perfluorooctanoic acid
PFOS - perfluorooctane sulfonate
QC - quality control
WG - groundwater
WQ - water QC

Data Qualifiers:
J - result qualified as estimate because it is less than the LOQ
M - result considered an estimate (L - low; H - high) due to matrix interference
ND - non-detect [LOD in brackets]

0003

FORT WAINWRIGHT FAMILY HOUSING

FAIRBANKS, ALASKA



SHEET INDEX

APPLICABLE CODES, ZONING PERMITS
REFERENCE GUIDES

UNIFORM BUILDING CODE 1979
With Amendments (Ord. No. 3852 and 4200)
Expect Approval UBC 1985

UNIFORM HOUSING CODE 1979

NATIONAL ELECTRIC CODE 1978
Expect Approval by Summer 1985

UNIFORM PLUMBING CODE 1982
Expect Approval 1985 by Summer 1986

STATE OF ALASKA FIRE SAFETY CODE OR UNIFORM FIRE CODE 1979
(1982 by Summer) Whichever is Most Restrictive

STATE AND BASE FIRE MARSHALL REVIEW

HANDICAPPED BUILDING CODE

FAIRBANKS GENERAL CODE OF ORDINANCES

CITY OF FAIRBANKS:
Design Guidelines for Streets and Drainage
Design Guidelines for Water Distribution System
Design Guidelines for Wastewater Collection System
Technical Requirements for Street Illumination Maintenance

FAIRBANKS STORM WATER RUNOFF STUDY 1980

Field Determination of Chena River Surface Elevation Immediately East of the Site of May 25, 1985, (Synchronizing with the Closing of the Gates at Moose Creek Dam on That Date) (By Civil Engineer)

Field Confirmed Aerial Mapping and Topographic Studies of Site - By Civil

FAIRBANKS NORTH STAR BOROUGH CODE
Title 18 (49) Zoning R31 Multi-Res.

FAIRBANKS NORTH STAR BOROUGH CODE
Title 17 - Subdivisions

FAIRBANKS COMPREHENSIVE DEVELOPMENT PLAN

FAIRBANKS CITY COUNCIL MAY WANT REVIEW AND INPUT
Paul Whitney 452-4761

HAMILTON ACRES RESIDENTS WILL WANT REVIEW AND INPUT ON TRAFFIC GENERATION AND BUFFER SPACE
George Roderic 452-5419

DEPARTMENT OF TRANSPORTATION
Will Want Review and Input on Traffic Generation Access, Direction and Public Bus System Generation
Charitt Fector

DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Will Require Review of Storm Water Runoff Into River
Pete McGee 452-1714

DEPARTMENT OF LABOR AND SAFETY REVIEW

DEPARTMENT OF NATURAL RESOURCES REVIEW

NORTH STAR BOROUGH SCHOOL DISTRICT REVIEW AND INPUT ON
School Assignments, Number of School Kids, Grades, Method of Transportation and On Site School Bus Locations
Bob Shefchik 452-2000

ALASKA RAILROAD CORPORATION WILL REQUIRE REVIEW AND INPUT FOR VERIFICATION OF ROW AND ACCESS CONFORMANCE
O.B. Weeks 265-2457

UNITED STATES POSTAL SERVICE WILL REQUIRE REVIEW AND INPUT ON MAIL DELIVERY SYSTEM

GOLDEN VALLEY ELECTRIC
- Review on all Site Electrical Distribution
Steve Hagesen

TELEPHONE UTILITY OF ALASKA
Will Review and Install Site Telephone System.
Developer Coordinated 356-1000

ALASKAN CABLE NETWORK
Will Review and Install Site System
Developer Coordinated 452-7191

TRASH COLLECTION
By Developer

FORT WAINWRIGHT FIRE AND POLICY DEPARTMENT REVIEW & INPUT

FHA (1 AND 2 FAMILY) AND DEPARTMENT OF DEFENSE GUIDELINES AND SPECIFICATIONS AND HUD MINIMUM PROPERTY STANDARDS

Design Reviews by the Corps of Engineers and Environmental Protection Agency

"Handbook of Steel Drainage and Highway Construction Products"

A Policy on Geometric Design of Highways and Streets; 1984, AASHTO

Highway Preconstruction Manual, Part 11, Chapt. 11, Alaska Department of Transportation and Public Facilities

Guide for Development of New Bicycle Facilities, 1981, AASHTO

An Informational Guide for Roadway Lighting, 1976, AASHTO

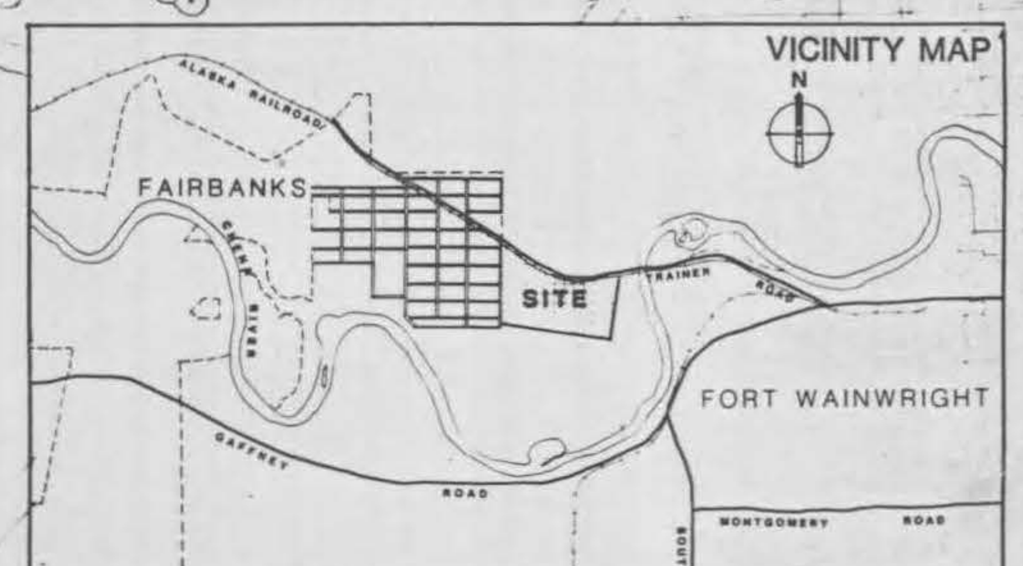
Preliminary Modeling and Balancing of the Water System by the "WOOD'S" Program (University of Kentucky). (Final Modeling to be Per WATSIM per RFP)

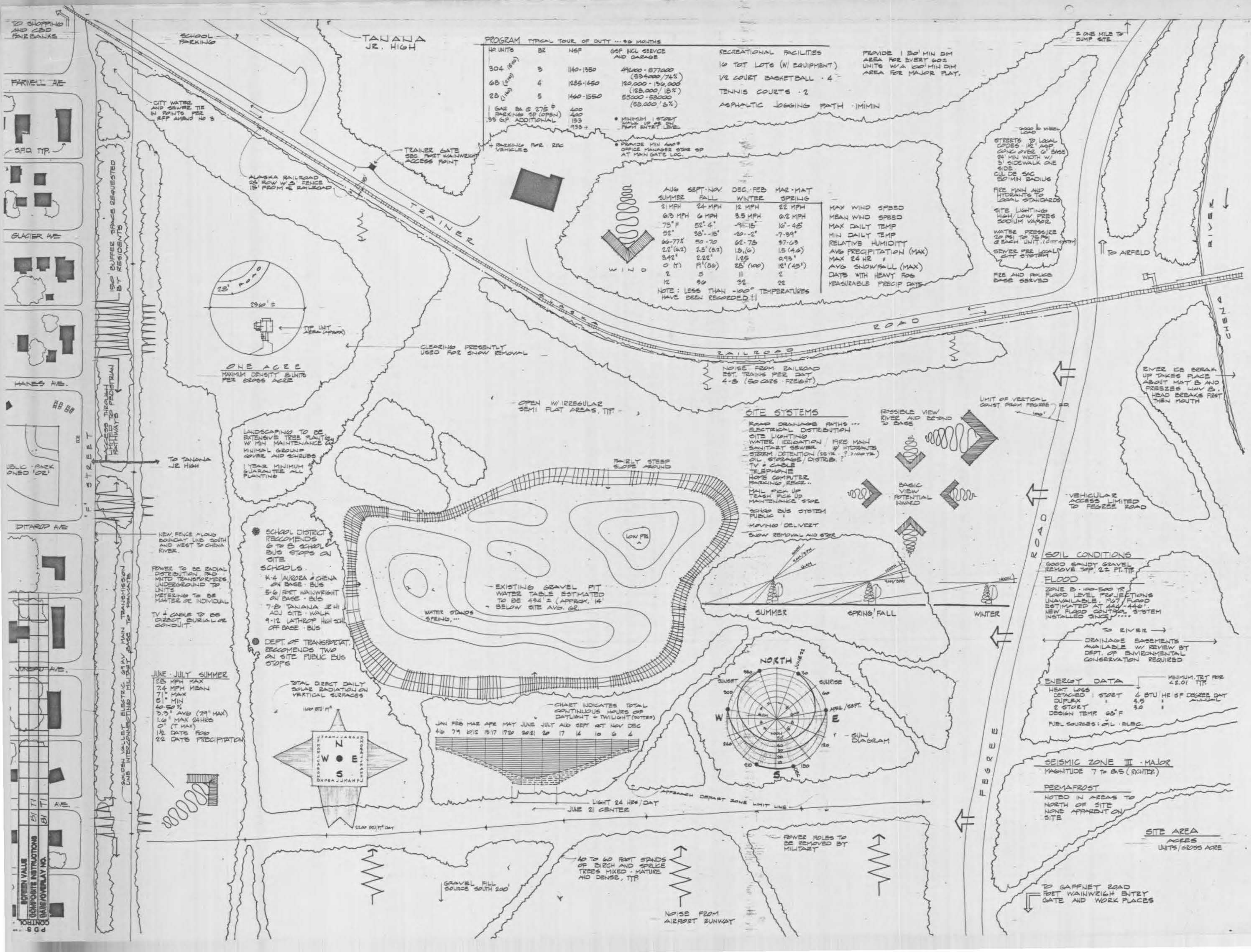
"Handbook - Ductile Iron Pipe", Cast Iron Pipe Research Association. Water Design

Schematic Design Review by the Fire Chief at Fort Wainwright

Arctic/Subarctic Urban Housing: Responses to the Northern Climate
By John Ross - 1967

Pattern Language
By Christopher Alexander - 1977





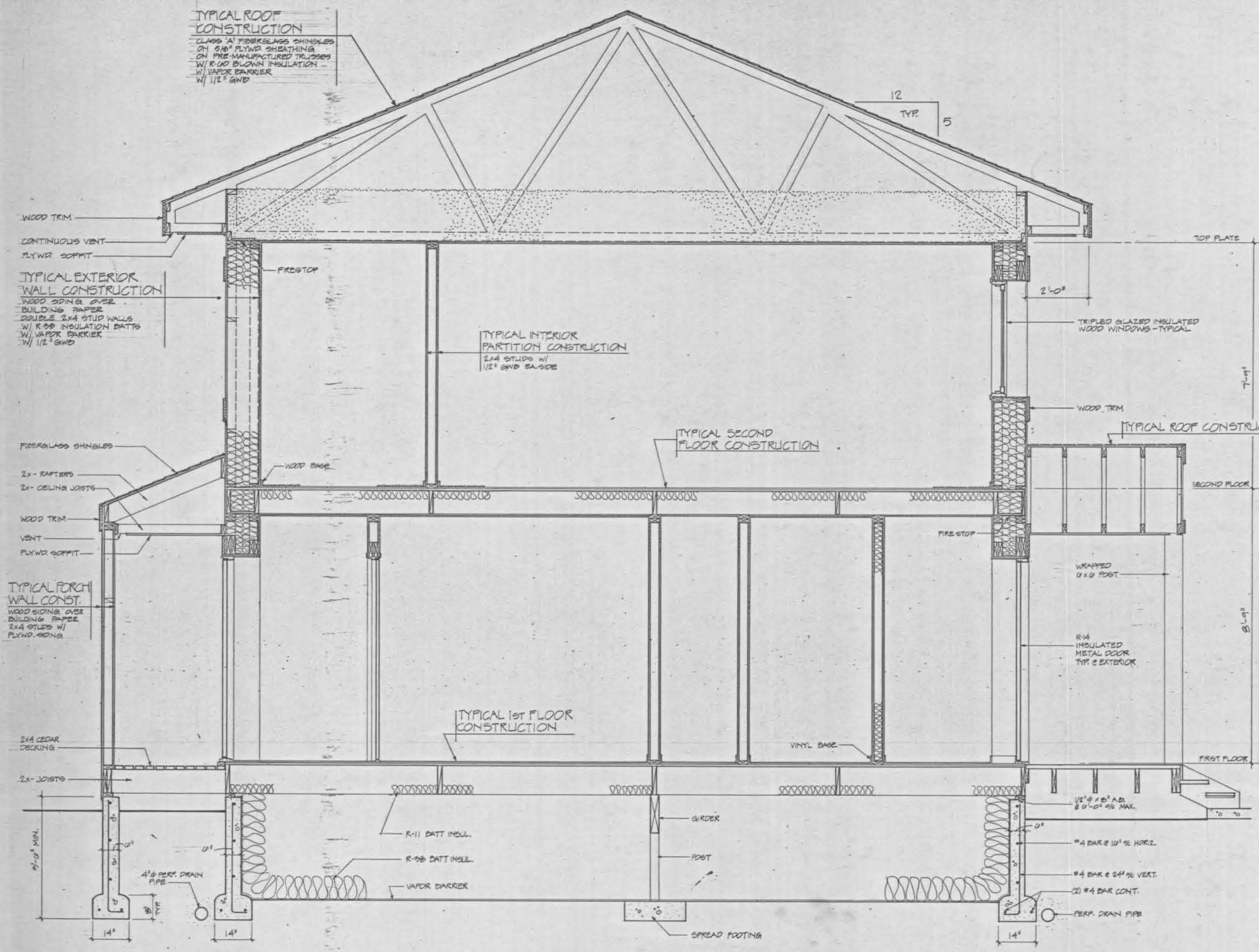
RFP NO. DACA85-85-R-0019
BID NO. FW0019003
JUNE 1985

FORT WAINWRIGHT FAMILY HOUSING
400 TOWNHOUSES
FAIRBANKS, ALASKA

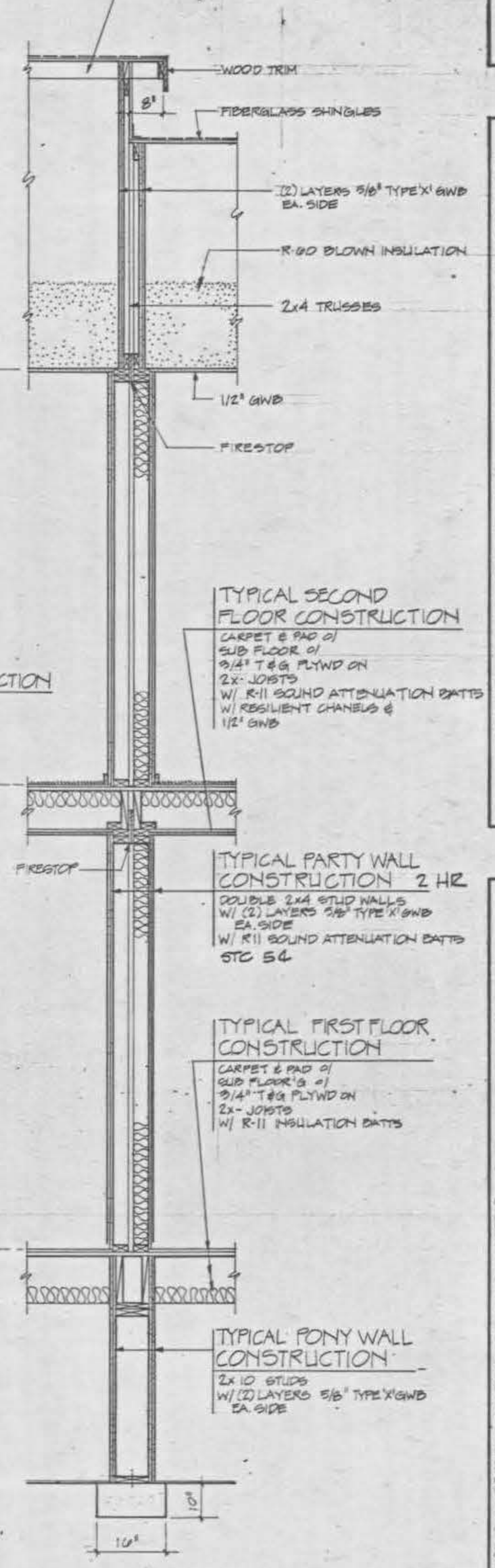
SITE ANALYSIS

2

DRAWING NUMBER
PLAN HOLD CORPORATION • IRVINE, CALIFORNIA
REORDER BY NUMBER 075AR
DRAWING NUMBER
PLAN HOLD CORPORATION • IRVINE, CALIFORNIA
REORDER BY NUMBER 075AR
DRAWING NUMBER
PLAN HOLD CORPORATION • IRVINE, CA
REORDER BY NUMBER 075AR



BUILDING SECTION



TYPICAL PARTY WALL

RFP NO.
DACA85-85-R-0076
BID NO.
FW0019005
JUNE 1985

FORT WAINWRIGHT FAMILY HOUSING
400 TOWNHOUSES
FAIRBANKS, ALASKA

TYP. BUILDING SECTION

33

SCREEN VALUE
COMPOSITE INSTRUCTIONS
BASE/OVERLAY NO.

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ATTACHMENT 13

Responses to Regulator Review Comments

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U.S. Army Responses to EPA Technical Review Comments, Draft Fort Wainwright Fourth Five Year Review, Fairbanks, Alaska, June 2016

GENERAL COMMENTS

EPA received the Draft Fort Wainwright Fourth Five Year Review, June 2016, for review transmitted electronically via AMRDEC on June 24, 2016. Due to the complexity of the review, EPA notified the Army of an extension for submission of comments. This comment table includes all EPA comments on the Draft Fort Wainwright Fourth Five Year Review (both regional and HQ and includes CERCLA and RCRA programs).

EPA comments were transmitted to the Army on August 10, 2016. Initial U.S. Army responses received September 12, 2016. EPA rebuttals and or suggested changes to Army response provided September 19, 2016. **A teleconference was held September 21, 2016. Revised Army responses are provided below (in blue) September 29, 2016.**

The filename transmitted by AMRDEC "FYR_FWA_Draft Final_2016-06_compressed.pdf″ suggests this is the Draft Final version of the Fort Wainwright Fourth Five Year Review. EPA considers this as the draft version of the document.

Number	Page	Section	Comment
1.	-	General Comment Report Format	The Draft Fourth Five-Year Review Report, Fort Wainwright, Alaska, dated June 2016 (the FYR) does not include all of the content outlined in Exhibit 3-3 of the *Comprehensive Five-Year Review Guidance* (the FYR Guidance), dated June 2001. The following contents are not included in the FYR: • The introduction text does not discuss the status of other five-year reviews, Operable Units (OUs), and/or areas of the entire site. **Response:** The introduction will be revised to include a brief discussion of other operable units and/or areas of the site and the previously completed first, second, and third reviews for Fort Wainwright Alaska (FWA). • The Question A discussions for each site do not include the early indicators of potential remedy problems. **Response:** Where appropriate, early indicators of potential problems will be discussed under the "Question A" headings. • The Question A discussions for each site do include the costs of the system operations/operations and maintenance (O&M). If the costs are not applicable, then this should be stated, but costs associated with maintenance and monitoring of groundwater monitoring networks should be included. **Response:** None of the OUs/sites evaluated contained operating remediation systems during the five-year review period. On-going remedial actions consisted of natural attenuation with groundwater monitoring and/or

			LUC/ICs. Costs to maintain the groundwater monitoring wells and monitor groundwater are not readily available. OSWER No. 9355.7-03B-P (Section 4.1.2) provides the following guidance, *"Review and consider system operations/O&M costs if they are available. Compare actual/current annual O&M costs to the original cost estimate; large variances from the original cost estimate might indicate potential remedy problems."* • The technical assessment discussions do not include a summary of findings and conclusions. **Response:** A fourth level section, "Technical Assessment Summary" will be added. Does this site qualify for a site-wide protectiveness statement? If construction is complete, then a site-wide protectiveness statement is required. **Response:** Remedial construction is not complete at FWA and the NPL site does not qualify for a site-wide protectiveness statement. New remedial actions have been constructed at FWA since the 2002 construction complete concurrence. They include, but are not limited to: • Expansion of the AS/SVE system at OU-3 ROLF; Eight-Car Header, Central Header, and Former Building 1144 (2004) • Building 1191 Landfill Caterpillar Shed preliminary investigation conducted (2012) In addition, remedial actions have not been completed at OU-3 Remedial Area 3, FEP Mileposts 2.7 and 3.0. Additionally, the electronic version of the document does not include bookmarks, making navigation and review of the electronic version difficult. Please revise the FYR to include all applicable content outlined in Exhibit 3-3 of the FYR Guidance and include bookmarks to at least the major sections of the report in any future electronic versions. **Response:** The FYR will be revised to include all applicable content outlined in Exhibit 3-3 of the FYR Guidance. Bookmarks will be provided in the electronic version of the report. Please contact us for assistance if the bookmarks are not present.
2.	-	General Comment IC boundaries	The figures included in the FYR do not provide sufficient information about the extent of remaining contamination and the extent of institutional control (IC) boundaries. For example, the site-specific figures in Attachment 1, Figures, do not depict the extent of groundwater plumes or IC boundaries. Attachment 10, Groundwater Monitoring Data, depicts plume extents for some contaminants of concern (COCs) at some sites, but does not consistently present this information

			for each site. Section 3.5 of the memorandum Recommended Evaluation of Institutional Controls: Supplement to the Comprehensive Five-Year Review Guidance (the Supplemental IC Evaluation), dated September 2011, recommends including "Maps that illustrate the areas of remaining contamination (e.g., contaminated ground water plume), parcel boundaries, and an overlay of any ICs that may be in place." In addition, it is important to show the extent of IC boundaries relative to the extent of contamination so that the adequacy of the IC boundaries can be evaluated. It is noted that Attachment 11 provides the extent of contamination and of IC boundaries for OU-6, but this information is not clearly provided for OU-1 through OU-5. Please revise the FYR to ensure site figures depict both the extent of contamination above cleanup goals and the extent of IC boundaries. **Response:** The five-year review figures will be modified to illustrate IC boundaries. Limited information on boundaries is available for OU-5 OB/OD. An updated figure will be added to the five-year review. More information will be collected during site closure activities once the range is no longer active. Figures illustrating groundwater plume are provided in Attachment 10. They will be updated to reflect any new information received since the draft June 2016 five year review report was issued.
3.		OU5 ROD as Basis of ICs	The 1999 OU5 ROD states (page 94): *"The FFA reflects the intent to have the ROD for OU5 serve as a comprehensive Sitewide document (see FFA, Attachment 1, page 6). The institutional-control actions at Fort Wainwright will apply on a site-wide basis to all areas, including those in OUs 1, 2, 3, 4 and 5. The ROD requires the U.S. Army Alaska (USARAK) to develop standard operating procedures (SOPs) to identify all land areas under restriction; identify the objectives that must be met by the restrictions; and specify the particular restrictions, controls, and mechanisms that will be used to achieve the identified objectives. These SOPs are intended to help assure that the institutional controls selected in this and other OU RODs at Fort Wainwright are carried out and remain in place until the EPA, ADEC, and USARAK determine they are no longer needed to protect the public and the environment. Upon concurrence by the EPA and ADEC, the SOPs will be incorporated by adoption as part of the OU5 ROD, to serve as a single site-wide source documenting all institutional controls being implemented at Fort Wainwright."* The ROD goes on to give the minimum requirements of SOP. However the SOP developed by the Army is not an enforceable document by the regulatory agencies, and does not provide specificity for individual site ICs. The Army recognizes the need to re-establish a robust institutional control program in the recommendation in Table 6-2. *"The site-wide SOP does not include documentation and information regarding all LUCs required*

			throughout FWA". EPA agrees a site-wide enforceable IC program should be developed with regulatory approval, however ICs do affect protectiveness and this recommendation should be moved to Table 6-1: Issues that Affect Protectiveness. The Army must develop an institutional control program containing details of the post-wide ICs. For example at OU5 OBOD, EPA would expect to see details such as 1) the rate of occurrence of patrols 2) the area covered by patrols 3) the location and number of signs prohibiting access. 4) pictures and location of the gate. While the 5 Year Review mentions the "Range Control Standard Operating Procedure," the 1999 ROD requires a post-wide IC SOP be developed and that the SOP becomes incorporated into the ROD. **Response:** The Army agrees to develop a revised site-wide IC program and has included this recommendation in the five-year review (see Table 6-2). The activities performed to date at the OB/OD (i.e., inspection, access control maintenance, etc.) have mitigated the potential for human exposure to unexploded ordnance specifically within the OU-5 OB/OD footprint. The formalizing of the administrative component of these activities does not affect protectiveness.
4.	-	General Comment Are exposure assumptions still valid?	The FYR Report does not discuss the source(s) of the exposure factors used in the original human health risk assessment (HHRA). As such it is unclear whether any of the risk and hazard estimates warrant revision. It is noted that since September 29, 2011, EPA has published several resources with more current exposure factors, including the Exposure Factors Handbook: 2011 Edition, dated September 2011; and OSWER Directive 9200.1-120 (Update of Standard Default Exposure Parameters), dated February 6, 2014. EPA has also promulgated a document to supplement aspects of the 2014 Update of Standard Default Exposure Parameters. This supplementary document, OSWER Directive 9285.6-03, originally dated February 6, 2014, was updated September 14, 2015 and is titled Frequently Asked Questions (FAQs) About Update of Standard Default Exposure Factors (EPA, 2015). The FYR should clarify if any of the exposure factors used in the original HHRA have changed since that time, and if so, if the changes are deemed substantive and necessitate re-calculations of risk and hazard. In evaluating exposure assumptions, EPA's FYR Guidance also states that the FYR should evaluate "whether there are changed or new land uses, including zoning changes, **changed or new routes of exposure or receptors**, **changed physical site conditions that may affect the protectiveness of the remedy, new contaminants**, or a new understanding of geological conditions." While it is understood that Attachment 8, Risk Assessment and Toxicology Evaluation, includes some discussion, the focus of this attachment is the vapor intrusion (VI) pathway and the comparison of groundwater concentrations to vapor

			intrusion screening levels (VISLs), so it is unclear whether there are changes related to other exposure factors and exposure assumptions. Please revise the FYR to include an in-depth evaluation of changes in exposure factors and exposure assumptions, including exposure pathways and receptors, and clarify if any of these changes affect the protectiveness of the remedy. **Response:** Please refer to the more comprehensive review of exposure assumptions provided in Attachment 8. A new paragraph will be added after the introductory paragraph in Attachment 8 stating the following, "*Note that for all of the OUs, older exposure factor values were utilized in assessing risk than what is currently recommended by the USEPA (USEPA 2014). However, the newly recommended exposure parameter values are generally less conservative than what was used in the past, and would not affect the protectiveness of the remedy. Therefore, this review will focus on aspects of updates to risk assessment methodology, exposure assessment, and toxicity criteria changes that may have occurred that could affect the protectiveness of the remedy.*" The USEPA 2014 OSWER Directive regarding updated recommended exposure factor values is included in the list of documents referenced in Attachment 8. Other aspects of the exposure assessment that may affect the protectiveness of the remedy, such as exposure pathways and site-specific exposure factor values, are discussed in more detail in the OU-specific evaluations that are presented in Attachment 8. The exposure pathways reviewed to verify whether there are changed or new land uses, changed or new routes of exposure or receptors, and changed physical site conditions that may affect protectiveness of the remedy.
5.	-	General Comment Toxicity Criteria	The FYR does not include sufficient comparisons of the toxicity criteria employed in the original HHRA to current toxicity criteria for each COC at each site. As such, it is unclear whether any of the risk and hazard estimates warrant revision. For example, the toxicity criteria for trichloroethene were updated in November 2011 and it was also reclassified as a mutagen. Similarly, toxicity criteria for tetrachloroethene were updated in May 2012. Note that this list of examples may not be exhaustive. Please revise the FYR to provide a comparison of the toxicity criteria used in the original HHRA to current toxicity criteria for each COC. Please also clarify if any re-calculations of risk and hazard are necessary to demonstrate continued protectiveness of the remedy and/or if cleanup goals should be revised on the basis that improved approaches are available for calculating new/current cleanup standards. **Response:** In Attachment 8, tables and accompanying text will be developed summarizing changes in toxicity values and assumptions used for cleanup goal development for each COC. For those constituents which are being cleaned up to a risk-based concentration (e.g., aldrin and dieldrin in OU-1, trimethylbenzenes in OU-3, tetrachloroethane in OU-4, bis(2-chloroethyl)ether in

			OU-5, and aluminum and manganese in OU-6), an explicit review of toxicity criteria utilized in developing the risk-based concentration is provided in Attachment 8 (text and supporting tables). Although the risk assessment which formed the basis for need for remedial action for other constituents (such as TCE and PCE) utilized toxicity criteria which may have since been updated, these constituents are being addressed using ARAR-based cleanup goals. As stated in Attachment 7 (ARAR review), there are no newly promulgated or modified requirements of federal and state environmental laws that would change the protectiveness of the remedies in any of the OUs. Therefore at this point, protectiveness of the remedy for those constituents that are covered by ARAR-based cleanup goals is determined via comparison to the ARAR, since the ARAR is by definition deemed to be protective. No re-calculations of risk or hazard are necessary for these constituents. The answers to Question B provided for each OU include this toxicity criteria (provided in more detail in Attachment 8) and ARAR review (provided in more detail in Attachment 7) for all constituents identified in each ROD.
6.	-	General Comment Vapor Intrusion	The FYR does not include any recommendations related to VI. Although Attachment 8 compares current groundwater concentrations to VISLs, this is insufficient to determine whether VI is a concern. EPA's *Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air* (OSWER Publication 9200.2-154, June 2015) strongly recommends the use of multiple lines of evidence paired with site-specific information (building construction, hydrology, geology, preferential pathways, etc.) in assessing the vapor intrusion exposure pathway. EPA also strongly recommends both current and future land use should be considered during the VI assessment. For example, page A8-4 of Attachment 8 states that *"Because the housing development is downgradient of groundwater that contains elevated VOCs [volatile organic compounds] in wells AP-6326 and AP-6327, and the full nature and extent of groundwater contamination in this area does not appear to be well defined from the groundwater results provided in the last five years (e.g., wells that surround wells AP-6326 and AP-6327 have not been sampled for VOCs in the past 10 years), there is uncertainty whether or not a vapor intrusion issue is present in the 801 Military Housing Area."* In addition, Attachment 8 includes recommendations that have not been incorporated into the Summary Form of the main text of the FYR. For example, page A8-4 of Attachment 8 states *"it is recommended that future sampling events include analysis of samples obtained from AP10042-MW and AP-7162 for VOCs,"* and *"it would be prudent to sample AP-6327, AP-6326, AP10042-MW and AP-7162 more frequently than every five years;"* however, neither of these recommendations are included for the OU-1 801 Drum

			Burial Site. Please revise the FYR to include recommendations related to VI and indicate how uncertainties related to VI impact protectiveness for any sites with VOCs in groundwater. Please also ensure any recommendations discussed in Attachment 8 are incorporated into the Summary Form of the main text of the FYR. **Response:** The recommendation to perform additional sample collection and assessment for vapor intrusion will be included in the main body of the five-year review. The recommendation will specifically include the collection of samples from wells AP-6327, AP-6326, AP-10042, and AP-7162 for analysis for VOCs and a subsequent VI assessment in accordance with OSWER Publication 9200.2-154. The site conceptual model and groundwater monitoring data were reviewed to assess protectiveness of the site. The Army concluded that there is no known VI impact on the housing development. • No VOCs currently exceed USEPA VISL at well AP-6326, the well closest to the housing development included in the monitoring program. The 2015 monitoring report included both a Mann-Kendall and linear regression trend analysis. No trend was identified using the Mann-Kendall trend analysis and a stable trend was identified using linear regression. • The monitoring wells located closest to the housing development were not sampled as agreed by RPMs based on recommendations generated in a Cleanup Operations and Site Exit Strategy (CLOSES) evaluation performed in 2004. • In the 19 years since the OU-1 ROD was signed, monitoring results have indicated that the groundwater plume is not moving or migrating but rather is stable. The protectiveness statement will correspondingly be changed to short term protective.
7.	-	General Comment Groundwater Trends	Some of the trend diagrams included in the FYR show increasing concentration trends; however, the FYR does not discuss how increasing concentration trends relate to remedy performance (i.e., is the remedy functioning as intended if concentrations are increasing). For example, Section 5.3.5 indicates that tetrachloroethene (PCE) and trichloroethene (TCE) in well AP-10017 have increasing trends and TCE has increasing trends in wells AP-8914R and AP-10016 at the OU-2 Defense Reutilization Maintenance Operation (DRMO) Yard. While increases in vinyl chloride concentrations are expected during reductive dechlorination, it is unclear why PCE and TCE concentrations are increasing at DRMO-1. Another example is found in Section 5.4.5, which indicates that 1,2-dichloroethane (1,2-DCA) concentrations are increasing in nine bedrock wells and four alluvium wells at the OU-3 Remedial Area 1B (Birch Hill Tank Farm [BHTF]). It should be noted that trend diagrams have only been provided in Attachment 10 for select COCs and

			sampling locations, so additional COCs and/or sampling locations may exhibit increasing trends beyond those identified in the text of the FYR. Please revise the FYR to discuss how increasing concentration trends relate to remedy performance (i.e., is the remedy functioning as intended if concentrations are increasing). If increasing concentrations are determined to indicate that the remedy is not performing as designed, then the FYR should be revised to indicate this and to include recommendations to address wells with increasing concentration trends. Please also revise Attachment 10 to provide trend diagrams for all COCs at each site. **Response:** Attachment 10 and the five-year review will be revised to evaluate increasing trends observed in the groundwater monitoring data for the COCs and sampling locations required to assess the performance of the remedies implemented at FWA (consistent with the data presented in reviewed and approved monitoring reports). Additional studies have been recommended for several sites (OU-3 Remedial Area 1B, OU-3 Remedial Area 2, OU-3 Remedial Area 3, OU-5 WQFS). The ICs in place across these areas prevent adverse exposures from impacts to these sites. These remedies are short term protective.
8.	-	General Comment MNA Cleanup Timeframes	The FYR should discuss the time estimated in the Records of Decision (RODs) to reach cleanup goals for all sites with monitored natural attenuation (MNA) as the ongoing remedy and whether cleanup goals will be achieved within that time period. If the estimated time has already passed without levels decreasing to concentrations below cleanup goals, then the FYR should explain why and provide a new estimate. For example, Sections 5.1 and 5.2 do not indicate the time estimated to reach cleanup goals for the OU-1 801 Drum Burial Site and the OU-2 Building 1168 Leach Well, respectively. Another example is found in Section 5.3.6.1, which indicates that reaching cleanup levels at the OU-2 DRMO Yard "is taking longer than the 15 years assumed in the ROD," but the FYR does not explain why or provide a new time estimate. In addition, where the RODs do not indicate a time period for reaching cleanup goals, the FYR does not include an estimation for the time period to reach cleanup goals. Please revise the FYR to discuss the time estimated in the RODs to reach cleanup goals for all sites with MNA as the ongoing remedy and whether cleanup goals will be achieved within these time periods. If the estimated time has already passed without levels decreasing to concentrations below cleanup goals, please revise the FYR to explain why and provide a new estimate of time to reach cleanup goals. Please also revise the FYR to include an estimation for the time period to reach cleanup goals in cases where the RODs do not specify a time period for reaching cleanup goals.

			Response: Estimated times provided in the RODs to reach groundwater cleanup goals and progress since implementation are discussed below. This information will be added to the FYR report. • OU-1 – The estimated time frame to reach the cleanup goals is 10 years (VOCs) and 100 years (pesticides) (ROD Section 5.5.4, p. 5-7). The remedy, monitored natural attenuation (MNA), was implemented in 1997. Benzene, cis-1,2-DCE, and dieldrin exceeded their cleanup goals in the most recent monitoring event (May 2015). The estimated time frame to reach the cleanup goals has passed for benzene and 1,2-DCE. However since the plume remains stable and there are no complete exposure pathways there is no increased risk to human health or the environment. • OU-2 – The estimated timeframe to reach the cleanup goals is 15 years (ROD Section 5.4.1.3, p. 83). o The remedy at Building 1168 Leach Well was fully implemented in 1997. Monitoring data indicate that the cleanup goals have been attained. o The AS/SVE remedy at DRMO Yard 1 (DRMO-1) was implemented in 1997 and shut down in 2005. In-situ chemical reduction (ISCR) substrates, zero valent iron, and organic material were injected in the aquifer in 2009 and 2010 to stimulate reductive dechlorination. PCE has exceeded the cleanup goal in one source area well (AP-10016); the estimated time frame has passed. However since the plume remains stable and there are no complete exposure pathways there is no increased risk to human health or the environment. All other COCs have been below the site cleanup goals. The most recent data (2015) indicate that PCE and TCE concentrations are increasing in upgradient well AP-10017. TCE is also increasing in source area wells AP-8914R and AP-10016. o Groundwater monitoring has been performed at DRMO-4 since the ROD was issued in 1997 (i.e. start of the remedial action). ISCR injections were conducted in 2009 and 2011. PCE concentrations have fluctuated above and below the site cleanup goals in two of three wells sampled; the estimated time frame has passed. Increasing trends are not identified for PCE. All other COCs have been below the site cleanup goals. TCE exhibits a potentially increasing trend in source area well PO5.

			• OU-3 – The estimated timeframe to reach the cleanup goals is no more than 30 years (ROD Section 10.0, p. 114). o The AS/SVE remedy at Remedial Area 1B (BHTF) was implemented in 1996 and terminated in 2005. A dual-phase product recovery system was installed in 1998. Groundwater monitoring has been performed since the ROD was signed in 1996. All COCs have attenuated to below the site cleanup goals in alluvial aquifer. 1,2-DCA exhibits increasing trends in four alluvial wells. COCs are still present in the bedrock aquifer above the site cleanup goals. Benzene, 1,2-DCA, and 1,2-EDB exhibit increasing trends in some of the bedrock wells. o The AS/SVE remedy at Remedial Area 2 (Valve Pits and Rail Off-loading Facility) was implemented in 1996 (six areas) and expanded in 1997 and 1998. The systems were terminated during 2009 to 2012. An ISCO treatability study was conducted in 2010. Toluene, 1,2-EDB, 1,2-DCA, 1,2,4-TMB, and 1,3,5-TMB have attenuated to the cleanup goals. Benzene exceeded the cleanup goal at five Valve Pit A wells in 2014, which is attributed to desorption from soil caused by flooding and an elevated water table. Benzene in two alluvial aquifer wells (1144-MP8 [Rail Off-loading Facility] and VPA-MP5 [Valve Pit A]) exhibit increasing trends and concentrations have exceeded the cleanup goal. Ethylbenzene (703 µg/L) in one alluvial aquifer well (GWP 49 [Rail Off-loading Facility] exceeded the cleanup goal in 2014. Ethylbenzene has either been not detected or present at trace levels in all 16 previous monitoring episodes. Other fuel-related VOCs (benzene and toluene) did not exhibit similar increases in 2014. o The AS/SVE remedy was not fully implemented at the Fairbanks-Eielson Pipeline Milepost 2.7 and 3.0 sites due to low soil permeabilities. Treatability studies were subsequently performed that involved excavation with ex-situ treatment and in situ treatment using an ORC. Benzene, toluene, 1,2-EDB, and 1,2-DCA exceed the cleanup goals. As discussed in the draft five-year review report (Section 5.6.5), the estimated timeframes to reach the cleanup goals were revisited in a 2011 monitoring report. The results ranged from three to 46 years at Milepost 2.7 and 32 years at Milepost 3.0. A data gap analysis has been performed at these sites to determine if there has been another potential source of groundwater contamination and to recommend future actions.

			• OU-4 – The estimated timeframes to reach the cleanup goals are 70 years (Landfill Source Area, [ROD Section 7.1, p. 94]) and 9 years (Coal Storage Yard [ROD Section 5.5.2.6, p. 81]). o A landfill cap was installed at the Landfill Source Area in 1997 and groundwater monitoring has been performed since the ROD was issued in 1996. The five-year review report discusses progress towards attaining the remediation goals (Section 5.7.5, page 79). o As discussed in the five-year review report (Section 5.8.2.2), an AS/SVE system was installed at the Coal Storage Yard in 1997 and shut down in 2000. Groundwater COCs have not been detected above the cleanup goals since 2001 and the Remedial Project Managers decided to discontinue the monitoring program in 2003 because the remedial action objectives had been met. • OU-5 o The estimated timeframes to reach the cleanup goals at the West Quartermaster's Fueling System (WQFS) are two years (WQFS1 source area) and 10 years (WQFS1 at Chena River) (ROD Section 7.1.3, p. 97). A source area AS/SVE system was installed in 1997 and expanded through 2001. It was shut down in 2005. A horizontal well AS/SVE system was installed in 1997 and expanded through 2001. It was shut down in 2005. Recent monitoring data indicates that diesel range organics (DRO), gasoline range organics (GRO), and benzene exceed their cleanup goals. The estimated time frames have passed. As indicated in the five year review report (Section 5.9.5, page 98), benzene trends are generally stable or decreasing, GRO concentrations are decreasing, and DRO concentrations remain stable. o The estimated timeframes to reach the cleanup goals are five years (WQFS2 source area) and five to 10 years (WQFS2 at Chena River) (ROD Section 7.1.4, p. 98). DRO and benzene have exceeded their cleanup goals; the estimated timeframes have passed. As indicated in the five year review report (Section 5.9.5, page 98), benzene trends are generally stable or decreasing, GRO concentrations are decreasing, and DRO concentrations remain stable. o The estimated timeframes to reach the cleanup goals are five years (WQFS3 source area) and five to 10 years (WQFS3 at Chena River) (ROD Section 7.1.5, p. 99). An AS/SVE system was installed in 2000. It was shut down in 2003 because benzene

			concentrations reached the cleanup goal. All COCs at this location are below the cleanup goals. o The estimated timeframe to reach the cleanup goal at the East Quartermaster's Fueling System (EQFS) is five years (EQFS treatability study area) (ROD Section 7.1.6, p. 10). An AS/SVE system was operated as a treatability study in 1994 prior to issuing the ROD in 1999. It was shut down 2005 because the groundwater cleanup goals were achieved. All COC concentrations are below the cleanup goals.
9.	-	General Comment MNA Geochemical Parameters	The site-specific remedial action discussions do not include information about the geochemical parameters used to assess MNA (e.g., whether they are analyzed, frequency at which they are analyzed, whether they indicate MNA is occurring, etc.). The FYR should include a discussion of geochemical parameters in the assessments of MNA performance monitoring for any site where natural attenuation is a remedy component, including an assessment of changes in the geochemical setting as indicated by geochemical parameters, particularly parameters such as the oxidation-reduction (redox) potential, dissolved oxygen, nitrate/nitrite, manganese (II), iron (II), sulfate, and methane, may suggest there are changes in biotic or abiotic processes affecting the rate and extent of natural attenuation, so monitoring of these parameters is key for performance monitoring of MNA. Please expand the site-specific remedial action discussions to include a discussion of geochemical parameters and a summary of what the parameters indicate about MNA for each site where MNA is a remedy component. **Response:** Information about the geochemical parameters used to assess MNA and a discussion of the results is provided for the OU-4 Landfill. CERCLA COCs have reached their cleanup goals at the OU-Building 1168 Leach Well site, the OU-4 Coal Storage Yard, the OU-5 WQFS3 site, and the OU-5 EQFS site. A discussion of geochemical parameters used in the assessment of MNA is unnecessary for these sites. Information about the geochemical parameters used to assess MNA and a discussion of the results will not be provided for OU-3 Remedial Area 3 FEP Mileposts 2.7 and 3.0 sites because they are undergoing a data gap analysis to determine the source(s) of groundwater contamination and recommend future actions. Information about geochemical parameters used to assess MNA and a discussion of the results will be provided for the OU-1 801 Drum Burial Site, the OU-2 DRMO Yard, OU-3 Remedial Area 1B (BHTF), OU-3 Remedial Area 2 (Valve Pits and ROLF), OU-5 WQFS1, and OU-5 WQFS2.

10.	-	General Comment Groundwater Contours and Plume Extents	The FYR does not contain a figure(s) displaying groundwater contours or groundwater elevation data to support the flow directions shown on the site-specific figures. Although this information is provided in Attachment 10 for some sites, groundwater contour data should be displayed on figures for all sites evaluated in the FYR, particularly given the complexity of groundwater flow at some sites due to seasonal impacts. In addition, the FYR does not consistently provide figures to display the current plume extents relative to the historic extents. For example, Figure 2-6 of Attachment 10 shows the extents of benzene and free product over time at the OU-3 Remedial Area 1B, but extents over time are not provided for other sites, such as the OU-1 801 Drum Burial Site and the OU-2 Building 1168 Leach Well. The FYR should demonstrate how the plumes have changed since the RODs were signed and since the previous FYR was completed to support statements regarding plume stability. Please revise the FYR to include figures displaying groundwater contours or groundwater elevation data for each site to support the flow directions shown on the site-specific figures. Please also revise the FYR to include figure(s) to display the current plume extents relative to their historic extents. **Response:** Updated figures showing plume extents and groundwater contours/flow directions will be included in Attachment 10. The information is sufficient to make protectiveness determinations.
11.	-	General Comment OU5 OBOD Figure and Site boundaries	The FYR does not provide a figure or a discussion that presents the exact boundaries of OU-5 Open Burning/Open Detonation Area (OB/OD Area), nor present the boundaries where ICs apply at the site. There are no photographs of the OU5 OBOD unit from the site inspection conducted for the FYR in 2015. In addition, it does not appear that the area described (in Section 5.12.1.1 "*The bermed area comprising the OB/OD site measures approximately 150 ft by 450 ft*.") encompasses all of the area required by the Department of Defense Ammunition and Explosives Safety Standards, Volume 5, Enclosure 3 (Areas Used For Intentional Burns And Detonations). While it is understood that a facility established in the 1960s timeframe would not be designed in accordance with today's standards, the current standards are designed using known blast safety and fragmentation distances that would have described the extent to which these traveled in the past. Please revise the FYR to include a text discussion and/or a figure that definitively presents the boundaries of the subject site and any distances to which munitions debris may have been expected from the detonations conducted. **Response:** The five-year review team was not provided access to the site during the inspection because range activities were occurring. However, photos of the site were taken during a metallic

			debris clearance survey conducted in June 2015 and are included in a Safety Clearance Summary Report prepared by the U.S. Army Engineer Research and Development Center (ERDC 2015), which was reviewed as part of this five-year review. The photos will be added to Attachment 5 of the five-year review report. Historical documents will be reviewed for maps/figures of the OB/OD area and all available figures be included in the five-year review. Updated figures will be generated if necessary once closure activities are initiated. The information presented in the safety clearance summary report confirms the Army's understanding of the OB/OD site, in that it verified there is neither surface nor subsurface munitions associated with the OB/OD site. Since the 1980s, this area has continued to be used as part of the operational range and therefore, intended use munitions may be found in the area. Since the OB/OD area is located within an operational range, the controls in place are those associated with the Range. These controls prevent residential exposure, warn the public of risks associated with range activities, and limit access to the site. Recent improvements made to the inspection and access controls at the OB/OD area will be added to the five-year review. A revised installation-wide IC program has been recommended in the five-year review.
12.		General Comment OU5 OBOD Characterization	EPA has acquired credible information during the FYR that contradicts a number of statements on the characterization of the OU5 OBOD unit. A member of the EPA contractor FYR review staff (a former member of the Department of Defense Explosives Safety Board) conducted these operations in the 1965-1966 time period while stationed at Fort Wainwright. The FYR characterization of the OU5 OBOD unit in section 5.12.1 and 5.12.1.3 claims "*The site was used by the U.S. Army from as early as the mid-1960s to as late as the mid-1980s for open burning/open detonation of unexploded ordnance and dud ordnance, unused propellants (black powder), rocket motors and small-arms ammunition.*" The FYR omits any discussion of the destruction of chemical agents at the site. The RCRA Facility Assessment for Fort Wainwright (1990) states *"In 1966 chemical agents were detonated and burned at the post demo range with diesel fuel in a trench"* (RFA, p. 28). According to the review contractor who conducted the operations at Fort Wainwright, there was *"open pit destruction by explosive venting and burning of two or three cylinders of mustard agent (H), a like number of cylinders of phosgene (CG), and a small drum of sodium cyanide. They were steel pressure type cylinders similar to those used today to transport compressed gas (much like a large hand-held carbon dioxide fire extinguisher) only shorter in length, approximately 2 to 2.5 feet in length and about 7 to 8 inches in diameter. The vented cylinders and the sodium cyanide*

			destruction drum were left in place when the burn pit was covered with dirt." Additionally, the last sentence in section 5.12.1.3 claims "*There is no evidence that the OB/OD Area was used to store or bury munitions or munitions debris*". Based on the EPA contractor review staff member's experience at the facility, the statement is incorrect for the following reasons: • In the 1960s (and perhaps later) the Explosive Ordnance Disposal (EOD) unit had a small bermed metal storage building that was used to store donor explosives used for emergency response and for destruction of ammunition by detonation. In addition, a small metal locker was located inside the berms, but outside of the metal building for the storage of blasting caps and detonators. • The site had a small arms popping furnace. In the early-mid 1960s time period, the munitions debris remaining after treatment was buried in shallow trenches near the popping furnace. Please revise the descriptions of the OU5 OBOD unit to more accurately reflect the types of hazardous materials that may have been destroyed, disposed of, or stored at the site. The FYR notes that only surface soil sampling (no lower than 6 inches below ground surface) was accomplished on the OB/OD Area in the past. The results of this would not be indicative of any residual contamination remaining from the subsurface burials conducted in the mid-1960s. The FYR does not evaluate questions A, B, and C for the OU5 OBOD unit. Please revise the FYR to include responses to these evaluation questions, with consideration of the hazardous materials which may have been destroyed, disposed of, or stored at the site. The FYR also does not discuss Issues, Recommendations for Follow-up Actions, or include a Protectiveness Statement for the OU5 OBOD unit. Revise the FYR to include these sections for the OU5 OBOD unit. Revise all sections of the FYR (Protectiveness Statements, Issues and Recommendations, Summary Form) to be explicit for the OU5 OBOD area separate from the other OU5 sites. **Response:** There was other information collected during the RI and at other times, all of which would need to be cited in the 5YR, if specifics about the basis for the no further action determination were to be included. The Army acknowledges that upon closure of the range this site will be evaluated and closed in accordance with an updated closure plan in accordance with the OU-5 ROD and RCRA permit, unless it is determined that closure can no longer be deferred. The ROD was an NFA ROD and the controls that were associated with the area being located within an active range were acknowledged in the ROD as a basis for the deferred closure, but were not part of

			the remedy. Since a remedy was not implemented at the OU5 OB/OD site, evaluation of questions A, B, and C is not applicable. The Army evaluated the OU5 OB/OD in the FYR to determine whether deferred closure remains appropriate, in accordance with the OU5 ROD. The Army review team has not been provided with any credible information contradicting what is known about the OU5 OB/OD. EPA is providing this anecdotal information about the historic use of the OU5 OB/OD which is inconsistent with and not supported by all information gathered closer to the time of use of the OB/OD and subsequently. If the Army receives any credible new information, it will evaluate that information to determine whether deferred closure of the OB/OD is still appropriate. The Army is continuing to review and research all available information on the OB/OD site; the Army awarded a contract in September 2016 for additional historical records research. The Army will reevaluate the site as appropriate based on any new information discovered. (Also see response to General Comment #11.)
13.		General Comment Discussion of all ROD COCs	The Five Year Review report does not discuss the trends and evaluate the remedies for all the Contaminants of Concern that were identified in CERCLA RODs. In particular, Operable Units listed comingled fuel contaminants in the RODs (OU 1, 2, 4, 5, and 6), however there is no discussion of DRO, GRO, RRO trends in this Five Year Review and if the remedies selected in the RODs are operating as expected and are protective. **Response:** See response to General Comment #7. Revise the Five Year Review to include a short discussion for each applicable OU and site with trends of DRO, GRO, and/or RRO and evaluate the protectiveness of the remedy including these contaminants. **Response:** Trends for DRO, GRO, and RRO will be discussed for sites that have these analytes as COCs. Statements about the persistence of DRO, GRO, and RRO will be added to the five-year review report for sites that do not include these analytes as COCs.
14.	-	General Comment Poly and Perfluorinated Compounds	The FYR does not discuss poly and perfluorinated compounds (PFASs), which are a significant emerging contaminant, especially in relation to OU4 which contains the Fire Training Area (deemed No Further Action in the OU4 ROD). The FYR for OU4 should be revised to discuss this emerging contaminant under Question B, *Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Still Valid?* and Question C, *Has any other information come to light that could call into question the protectiveness of the remedy?*

			The Army released a policy directive on June 10, 2016 which states: d. Army cleanup programs – The Army will research and identify locations where PFOS and PFOA are known or suspected to have been released on Army installations. The Army will assess and investigate releases and implement necessary response actions using the authority provided in References 1a-1e and other applicable DERP policies and guidance. Priority will be given to assessing known or suspected releases on Army installations where an Army-owned or operated water system has confirmed PFOS and PFOA levels above the HA, or where Army installations are within 20 miles of non-Army public water systems known to have exceeded the PFOS and PFOA HA levels. The Army will evaluate whether a release from these installations is contributing to the PFOS and PFOA levels in those water systems' source water. Where it is determined that PFASs may be present at a site, the FYR should also discuss how the potential extent of PFAS contamination will be assessed, including recommendations and a timeframe to address the recommendations. Please revise the FYR to discuss PFASs as an emerging contaminant, including recommendations and a timeframe for addressing these recommendations. **Response:** The OU-4 ROD did not require further action at the Fire Training Area and specifically states "the five-year review will not apply to this action" in Appendix A; therefore, this site is not included in the five-year review. The Army will evaluate the potential release of PFCs at the Fire Training Area outside the five-year review in accordance with Army guidance. If it is determined that a potential release has occurred which may pose an unacceptable risk to human health or the environment, the Army will either re-open the site or a new site will be created, as appropriate, and response actions at the site, as necessary, will be performed pursuant to CERCLA and the FFA. The Army has already conducted sampling for PFCs in OU-6. This data and a subsequent discussion of the impacts of detected PFOS and PFOA on the site protectiveness have been added to the five-year review.
15.		General Comment 1, 4 Dioxane	1-4 Dioxane is an emerging contaminant that is found in groundwater plumes in association with TCE and 1,1,1-TCA. Both Operable Unit 2 DRMO and Operable Unit 4 Landfill sites contain TCE contaminants in groundwater. The Five Year Review does not consider this emerging contaminant in the analysis of protectiveness of the remedies at OU2 DRMO and OU4 Landfill. EPA Regional Screening Levels have calculated a screening level of 0.46 micrograms per liter (µg/L) for 1,4-Dioxane in tap water, based on a 1 in 10^{-6} lifetime excess cancer risk and a Hazard

			Quotient = 0.1. This screening level is not enforceable but provides a useful gauge of relative toxicity. Consider the emerging contaminant in the analysis of remedy protectiveness in association with TCE and/or 1,1,1,-TCA groundwater plumes at OU2 DRMO and OU4 Landfill. If data does not exist at these sites, develop a recommendation to assess the presence of this contaminant. **Response:** In accordance with Army guidance on emerging contaminants, the Army will evaluate whether a release of 1, 4 Dioxane may have occurred at these units. The Army will then determine whether the contaminant presents an unacceptable risk to human health or the environment. If an unacceptable risk exists, the Army will evaluate the existing remedy to determine if it will address the unacceptable risk/release. If the remedy will not address the unacceptable risk caused by the release, the DoD Component may need to conduct additional response actions (e.g., focused investigation, risk assessment to evaluate the contaminant release to the environment) and/or prepare additional documentation (e.g., Explanation of Significant Differences (ESD), Record of Decision (ROD) amendment), if required by the NCP. The Army will coordinate these activities with the EPA and ADEC. The Army is aware of and will consider the Air Force Study in addition to scientifically supported studies related to releases of 1,4-dioxane when determining a path forward related to this emerging contaminant. Recommendations for further study are included in the following sites: • OU-1 801 Drum Burial Site • OU-2 Building 1168 Leach Well and DRMO Yard • OU-4 Landfill • OU-5 WQFS and EQFS The five-year review will include an evaluation of potential exposure pathways and potential risk to support the conclusion that existing ICs at these sites maintain short term protectiveness.
16.	-	General Comment Inspection Checklists	It appears that the Inspection Checklists in Attachment 4 were included for each OU rather than for each site. In combining all sites within an OU into one inspection form, there are a number of examples where the information presented is inaccurate. Typically inspections are site-specific since the FYR presents summaries, conclusions and recommendations on a site-specific basis. An Inspection Checklist is completed for each site to support the discussions in the FYR. In addition, Section 3.5.3 of the FYR Guidance states that site inspection should be recent and defines “recent” as “no more than nine months from the expected signature date of the review.”

			Please ensure that an Inspection Checklist is completed for each site during future FYRs. Please also ensure site inspections for future FYRs are conducted no more than nine months from the expected signature date. **Response:** Comment noted
17.		Suggested Protectiveness Statements	The following protectiveness statements either use the language provided in the Five Year Review or modify the protectiveness statement from the FYR and suggest additional considerations. The statements do not take into account remedy protectiveness for DRO and RRO contaminants as these were not included in the draft FYR for consideration. <u>OU-1</u> The protectiveness should be deferred at OU1 due to an undefined plume at 801 Burial Drum Site and not enough data to make a conclusion on the VI pathway. VOC groundwater data, particularly in wells near the western boundary with the housing area, will be collected prior to the next FYR and VI assessment performed prior to 2021. **Response:** In accordance with Army response to general comment 6, a recommendation has been added to the five-year review to collect additional groundwater data and assess the VI pathway at OU-1. Information has been provided to support a short term protectiveness statement. Attachment 8 will be revised to indicate that trimethylbenzene (TMB) was not detected in well 6326, which is closer to the housing unit. Because of this, vapor intrusion screening level (VISL) exceedances associated with TMB in wells 6327 and 10101 are not a concern. <u>OU-2 (Bldg. 1168 and DRMO)</u> The remedies at OU-2 are currently protective of human health and the environment because: • All RAOs have been attained at the Building 1168 Leach Well site. • Migration of COCs in groundwater from the DRMO-1 and DRMO-4 source areas has been reduced by the remedial actions and additional in-situ treatment • ICs are in place to ensure that groundwater containing COCs will not be used. However to be protective in the long term:

			• Increasing trends of PCE, TCE in OU2 DRMO1 upgradient well a concern in high groundwater years suggest a source of contaminant remains in soils. • The emerging contaminant 1,4-Dioxane needs to be assessed especially in association with TCE groundwater plumes. **Response:** The increasing concentrations of TCE in source area monitoring well AP-10016 may be associated with attenuation of PCE. The concentrations of PCE at this location are stable. Increasing concentrations of PCE and TCE detected in upgradient monitoring well AP-10017 are not expected to affect protectiveness as the concentrations of these contaminants do not exceed cleanup goals at this location. The highest concentration of PCE was detected in 2014 at 2.0µg/L, less than half the cleanup goal of 5.0µg/L. The PCE concentration detected in 2015 at AP-10017 was 1.3µg/L. The Army will continue to monitor PCE and TCE locations at OU-2 DRMO-1. A recommendation has been added to the five-year review to perform an evaluation for 1,4-dioxane at both the Building 1168 Leach Well site and the DRMO Yard. OU-3 The remedies at OU-3 currently protect human health and the environment because: • For all groundwater contaminants except DCA, migration of contaminated groundwater has been reduced by the remedial actions and natural attenuation. • ICs are in place to ensure that groundwater containing COCs will not be used. • Off-post risks associated with the consumption of contaminated groundwater at Remedial Area 1B are mitigated by attenuation of COCs in the alluvial aquifer. However, in order for the remedies to be protective in the long-term, the following action needs to be taken: • Remedial Area 1B – short term protective, no exposure and no risk but time frame for cleanup exceeded, and a migrating groundwater plume. Land use change (both adjacent housing development and removal of ASTs) may affect future protectiveness. • ROLF, Valve Pit A – groundwater timeframes exceeded, increasing trends of benzene with elevated groundwater levels from fall flooding impacts.

			• Re-establish the cleanup goals for 1,2,4-TMB and 1,3,5-TMB in groundwater using either of the following methods: 1) update the RBCs by including the inhalation pathway and using information from a new USEPA IRIS toxicity assessment that is currently under development (scheduled for completion by the end of calendar year 2016), or 2) adopt the cleanup goals established in 18 AAC 75. • Continued Monitoring in OU3 wells for contaminant concentrations, especially after Area 1B land use change. • EDB and DCA increasing trends reveal these groundwater plumes not stable at Remedial Area 1B **Response:** • 2nd paragraph, 1st bullet (Remedial Area 1B); a recommendation has been added to the five-year review to conduct an investigation in this area and the protectiveness statement is short term protective (ICs prevent adverse exposures). • 2nd paragraph, 2nd bullet (ROLF, Valve Pit A); see response to general comment 8. The estimated time frame to reach the cleanup goals is no more than 30 years, or by 2026. A recommendation has been added to the five-year review to conduct an investigation in this area and the protectiveness statement is short term protective (ICs prevent adverse exposures). • 2nd paragraph, 4th bullet (OU3 wells); the five-year review report does not recommend discontinuing groundwater monitoring at the OU-3 sites. It is an on-going activity and not a new action needed to ensure protectiveness of the remedy. • 2nd paragraph, 5th bullet, (EDB and DCA); a recommendation has been added to the five-year review to conduct an investigation in this area and the protectiveness statement is short term protective (ICs prevent adverse exposures). <u>OU-4</u> The remedies at OU-4 are deferred protective of human health and the environment because: • All RAOs have been attained at the Coal Storage Yard.

			• ICs are in place at the Landfill Source Area to ensure that contaminated groundwater will not be used until the cleanup goals are attained. However to be protective in the long term, the emerging contaminant 1,4-Dioxane must be analyzed in wells, especially deep wells where TCE and 1,1,2-TCA are present. Increasing TCE, cis12-DCE trends in intermediate and deep wells at the OU4 Landfill should continue to be monitored. Presence of Poly and Perfluorinated Compounds at the OU4 Fire Training Area have not been adequately evaluated for human health risk pathway (public water supply and emergency supply wells). **Response:** A recommendation has been added to the five-year review to evaluate the Landfill site for 1,4-dioxane and the site is identified as short term protective. The short term protectiveness statement is supported in the five-year review by assessing potential receptors and exposure pathways should 1,4-dioxane be detected at this site. A recommendation was not added for the OU-4 Fire Training Area because this site is not subject to five-year reviews. The Army will assess this site for PFCs outside the five-year review. <u>OU-5</u> The protectiveness should be deferred at OU5 due to recent institutional control failures and data gaps at the OBOD site to define site boundaries and hazardous constituents. The remedies at OU5 WQFS/EQFS are currently protective of human health and the environment. However at WQFS, mitigation of sheen to the Chena River with an absorbent boom was not a component in the OU5 ROD. Increasing trends of benzene and potential migration of groundwater plumes are evidence of a remedy not fully functioning as intended in the OU5 ROD. **Response:** The referenced institutional control failures are specific to the Tanana River site (which is not subject to the five-year review process) and the Range Control SOP was not in effect at the time the Tanana River site was discovered. The Tanana River site is independent of the OU-5 OB/OD site and the Army has maintained ICs at the OB/OD site as required by the ROD since 1999. The five-year review has been revised to include more details of IC implementation at the OB/OD site. A revised installation-wide IC program is also recommended in the five-year review to supply additional administrative components to the ICs. A protectiveness statement has been added to the five-year review for the OB/OD site based only on information specific to the OB/OD

			site. The Army maintains that the deferred remedy at the OB/OD site is protective because of the implemented ICs. The OU-5 OB/OD site will undergo RCRA closure at a later date. The five-year review has been revised to include a recommendation for an investigation to evaluate whether additional source area(s) are present at the WQFS and the site is short term protective. Despite their persistence, monitoring data has shown that the groundwater plumes are stable. Sheen observations at individual stations along the boom indicates a decreasing trend in NAPL migration to the river. The Risk Assessment and Toxicology Evaluation (Attachment 8 to the five-year review) determined that the WQFS remedy remains protective of the environment (Chena River). <u>OU-6</u> The remedy at OU-6 is protective of human health and the environment because ICs are in-place to ensure that human exposure to contaminated soil and groundwater will not occur. Protectiveness at OU-6 would be deferred if the area was used as a fire training area during the time frame when Aqueous Fire Fighting Foams were used and if the presence of PFAS in groundwater has not been assessed at the site. **Response:** Investigations were performed at OU-6 to assess the site for the presence of PFCs. The investigation results and an assessment of impacts on the remedy protectiveness have been added to the five-year review. The five-year review maintains the remedy at OU-6 is protective.
SPECIFIC COMMENTS			
1.	xv		Include the OB/OD Area in the list of sites. **Response:** The OU-5 OB/OD area is referenced in the Executive Summary since the OU-5 ROD requires the Army to evaluate deferred closure during FYRs; however, it is not on the list of sites subject to the five-year review because remedial actions have not been taken at the site.
2.	xvi	Bldg 1168 and DRMO Yard	The descriptions of the remedies for these sites includes AS/SVE system, an in-situ chemical oxidation or reduction treatability study, natural attenuation of groundwater with long term monitoring/evaluation, and ICs. Please remove the reference to the ISCO and ISCR treatability studies from the remedy description as these were not actions evaluated nor selected in the OU2 ROD. **Response:** Requested change will be made.

3.	xvii	DRMO Yard	Please add to the list of ICs at DRMO yard the prohibition on the filling of the DRMO yard fire suppression water tank from the existing potable water supply well. **Response:** The fire suppression water tank was re-filled by the existing potable water supply well. The water was tested and no exceedances of the State and Federal MCLs were identified. The Army will restrict future use of the DRMO Yard potable water supply in accordance with the ROD.
4.	xix	OU5 Remedial Area 1A (BHTF AST)	The OU5 ROD states *"Soils containing petroleum and other contaminants will be cleaned up when the tanks are removed under the conditions of the Two-Party Agreement."* As the BHTF AST site was originally in the OU3 ROD, the OU3 ROD discusses the preferred alternative for Remedial Area 1A in section 12 as excavation with soil washing, and a contingency of off-site disposal but defers selection of the remedy to the OU5 ROD. The OU5 ROD does not say 'removal of contaminated soil'. The chosen remedy was Alt 2, ICs and land use restrictions. Throughout the document, correct any reference to the remedy for OU5 Remedial Area 1A BHTF AST as ICs and land use restrictions. Cite the authority for the soil removal action at OU5 Remedial Area 1A. If this site is included in the 2-party agreement, document the removal action under that process. **Response:** Requested changes will be made.
5.	xxii	OU5	Need to break out the OU5 sites in this summary area and be explicit for each site. WQFS, EQFS, OBOD, Remedial Area 1A. What does this mean that the remedies at OU5 have not been completed? The AS/SVE systems have been installed, run, and decommissioned at most of the sites within this OU. If this is referring to the soil removal at OU5 Remedial Area 1A, the authority under the Two Party Agreement to complete this action should be referenced. **Response:** USEPA Guidance (OSWER No. 9355.7-03B-P and OSWER 9200.2-111) requires a separate protectiveness statement for each **operable unit** where the remedial action is currently underway or remedial construction is complete. Exhibit 3-3 of OSWER 9355.7-03B-P further indicates that a protectiveness statement(s) [should be] developed at the **OU level**. The OU-5 protectiveness statement on pages xxii, xxvi, and 131 reflected the least protective determination for OU-5, which was Remedial Area 1A (BHTF ASTs). The determination for this site has been changed to “protective” based on the response to specific question 31. The protectiveness

			determination for OU-5 on pages xxii, xxvi, and 131 will be revised to reflect the least protective determination for all OU-5 sites.
6.	xxii	OU6	Add to the OU6 summary that groundwater monitoring will be part of the evaluation of the remedy in the future. **Response:** Requested changes will be made.
7.	xxiii and 4	Summary Form and Table 2-1	According to the Summary Form, construction complete has not been achieved, but Table 2-1 indicates that a Site-Wide "FWA [Fort Wainwright Alaska] Construction Complete concurrence received from the USEPA" was received in 2002. The EPA database shows Construction Complete in 2002. Fort Wainwright Fairbanks North Star Borough AK6210022426 09/27/2002. Please resolve this discrepancy. **Response:** Remedial actions have not been completed at OU-3 Remedial Area 3 (FEP Mileposts 2.7 and 3.0).
8.	2 through 11	Table 2-1	Table 2-1 is inconsistent across OUs for dates when reports were finalized vs sent to EPA, RDRA workplans, injections as treatability studies, and references draft documents. Also some of the applicable major events not included in Table 2-1. For example, Table 2-1 does not list post-ROD monitoring events. This information should be included in the site chronology because MNA is part of the selected remedy for several sites included in the FYR. Another example is found under the OU-2 DRMO Yard section of Table 2-1, which does not include an entry for the Remedial Investigation (RI). Per Exhibit 3-3 of the FYR Guidance, site chronology should include "decision and enforcement documents, start and completion of remedial and removal actions, construction completion, and prior five-year reviews." Please ensure the site chronology provided in Table 2-1 includes the dates for all major events related to remedy documentation and implementation. **Response:** Table 2-1 will be checked to verify final report dates. Any discrepancies or incorrect dates will be corrected. USEPA Guidance (OSWER No. 9355.7-03B-P, Exhibit 3-3 and Appendix E, Table 1) does not require identifying post-ROD monitoring events in the chronology of site events. To address USEPA's concern, a single entry will be made under each OU heading that identifies completed monitoring events. Final report dates will be added to the "Date" column.

			Make sure the ISCO/ISCR actions are specified as treatability studies, otherwise this is implementing a remedy outside the CERCLA process. **Response:** Concur, all references to the ISCO/ISCR actions will be annotated as treatability studies. Page 8, why are Fire Training Pits showing up here? Was the removed soil placed in the OU4 Landfill? The OU4 ROD was NFA for the Fire Pits, but instead completed a soil removal action? **Response:** The Fire Training Pits soil removal action was inadvertently included in the table. Since this site is not subject to the five-year review, the table has been corrected. Page 9 says the CRAAP investigations were performed in 1997-98 timeframe, but not terminated until 2010. What happened in the intervening years? **Response:** The chronology table will be corrected as follows: Initial investigation 1997-1998 Additional investigation 2002 No further investigation deemed warranted by RPMs 2005 Page 11 should include the date the OU6 RDRA was finalized (June 2015). **Response:** Concur, the table has been updated with the RDRA.
9.	15	4.5	Remove this sentence "*State and Federal regulatory authorities were invited to attend the site inspections but declined.*" This is very disingenuous. EPA was given less than 2 days advance notice of when the site visit would occur. **Response:** Requested changes will be made.
10.	23	5.1.6.2	State the Attachment 8 conclusions in this section. **Response:** Concur, conclusions from Attachment 8 will be added to this section.
11.	24	5.1.8	Bring the Attachment 8 recommendations forward (increased sample frequency, reinstate sampling at wells closest to the housing area). **Response:** Concur, conclusions from Attachment 8 will be added to this sections.

12.	37	5.3.3	Move this sentence "*As a result of this evaluation*…." to just after the MAROS reference. It makes it sound like the EPA Groundwater stats tool led to the 2nd ISCR injection. **Response:** Requested change will be made.
13.	38	Section 5.3.4	Section 5.3.4 states that, *"Some of the probes appeared to be frost-jacked; however, installation staff noted that sampled wells were not affected,"* but any wells retained in the monitoring network should be evaluated for repair or replacement if impacted by frost jacking or other damages as part of remedy O&M. Please revise Section 5.3.4 to include a recommendation to evaluate frost jacked wells for repair or replacement at the OU-2 DRMO Yard. **Response:** Requested change will be made.
14.	38	Section 5.3.5	According to the second to last bullet point on page 38, *"exceedances at AP-10016 were attributed to high water levels that may have caused contaminants on the soil to desorb to groundwater;"* however, it is unclear whether rising groundwater levels are a trend at the OU-2 DRMO Yard or other FWA sites. If groundwater levels continue to rise, desorption of contaminants from soil to groundwater may become an ongoing concern and may warrant additional action. Please revise the FYR to discuss whether rising groundwater levels are a trend at the OU-2 DRMO Yard or other FWA sites and how this may impact groundwater concentrations. **Response:** According to the final 2015 Monitoring Report for OU-2, precipitation was above average in July and August 2015 and the August 2015 groundwater level was higher than average levels measured during fall sampling events. Graphical presentation of groundwater levels provided in the monitoring report illustrates that rising levels are not a trend at the DRMO Yard.
15.	43	Section 5.4.1.2	The first paragraph of Section 5.4.1.2 states, *"Bottled water was supplied to the Steese Chapel, which has been discontinued at their request,"* but the text does not specify when supply ceased or how drinking water is supplied to Steese Chapel (the text indicates that church's supply well is not currently used for drinking water). Please revise Section 5.4.1.2 to specify when bottled water supply was discontinued for the Steese Chapel. Please also revise Section 5.4.1.2 to specify how drinking water is currently supplied to Steese Chapel. **Response:** Bottled water supplied by the Army to Steese Chapel was not being consumed and the chapel verbally requested discontinuing the supply. The chapel has since installed a reverse osmosis treatment system on their water supply well. Water for the Shannon Park Baptist Church

			is supplied by the Army. The church's water tank is filled. This information will be added to the five-year review report.
16.	43	Section 5.4.1.2	Section 5.4.1.2 indicates that 91 of the 220 lots at the Lazelle Estates residential housing development were built by 2007, but does not indicate how many of the lots had been developed at the time of the FYR. Please revise Section 5.4.1.2 to specify how many of the 220 lots at the Lazelle Estates have homes at the time the FYR was prepared. **Response:** The five-year review will be revised to state the number of lots currently developed.
17.	59	Section 5.5.5	The discussion for Valve Pit B indicates that a "*third program well was severely damaged and scheduled for replacement in 2015,*" but it is unclear whether this well was replaced and sampled in 2015. In addition, the discussion for Valve Pit C states well VPCMP6 "was damaged before 2011 and could not be sampled," but it is unclear why this well has not been replaced in the five years since then. Please revise Section 5.5.5 to discuss the damaged wells at Valve Pits B and C and whether data from replacement wells is available. **Response:** The damaged Valve Pit B well, VPB-MP1 (a groundwater probe), was replaced by well AP-10292MW. It was sampled in 2015; results are provided in the 2015 OU-3 monitoring report. VPC-MP6 (a groundwater probe) has not been sampled since it was damaged in 2010. Groundwater samples have since been collected from VPC-MP2, which historically had the next highest contaminant concentrations of the site wells. VPC-MP2 is located upgradient of VPC-MP6, near the former valve pit. (See final 2014 OU-3 Monitoring Report). This information will be added to the five-year review report.
18.	69	Section 5.6.5 and Section 5.6.9	The last paragraph in Section 5.6.5, Data Review states "*This five-year review has determined that permafrost and low permeability soils inhibit groundwater flow and the migration of contaminants from the sites. They also limit the robustness of remedial actions and natural attenuation*". Sufficient data and analyses have not been provided to support these conclusions, in fact the data provided is contrary to these conclusions. The concentration trends in the wells have fluctuated with some wells showing increasing trends for COCs with other wells showing decreasing or stable trends. In addition, the extent of contamination is not fully delineated with no monitoring wells to the north, west and east of monitoring wells with exceedances of ROD Cleanup Levels (see Figure 5-7). Please provide a more robust analysis using the Monitoring and Remediation Optimization System (MAROS) or any other appropriate method that supports the statements that permafrost and low permeability soils inhibit groundwater flow and the migration of contaminants from the sites, and limit the robustness of remedial actions and natural attenuation. If the statements cannot be

			validated by existing data, then please state that the concerns related to the extent of contamination and the migration of contaminants from the sites will be addressed by the proposed data gap investigation. This comment also impacts the presentation in Section 5.6.9 for the Protectiveness Statement. **Response:** The concentrations of benzene in groundwater remain high and exhibit increasing trends in several wells. Analysis has shown that the groundwater cleanup goals will not be achieved at the FEP Milepost 2.7 and 3.0 sites within a reasonable amount of time. The third five-year review estimated the time to reach the cleanup goals is 46 years (Milepost 2.7) and 32 years (Milepost 3.0). The current five-year review acknowledges that, due to the extent and magnitude of groundwater contamination at these sites, a data gap analysis is in progress. It is currently under contract by the Army. The cited statement from the last paragraph in Section 5.6.5 will be removed from the report. The following statement will be added, *"A scheduled data-gap analysis will provide additional source characterization to establish the extent of contamination and identify potential transport pathways. It will support the assessment of exposure risks and selection of any associated remedial measures."*
19.	69	Section 5.6.6.1	To answer Question A whether the remedy is functioning as intended, increasing benzene concentration trends have been called out to indicate that it is not functioning as intended. However, other COCs including gasoline range organics (GRO), toluene, and ethylbenzene have exhibited an increasing trend in at least some of the wells. Please mention the complete list of COCs that have exhibited increasing concentration trends to illustrate that the remedy is not functioning as intended. **Response:** All groundwater COCs that are present above the cleanup goals and exhibit increasing trends will be mentioned.
20.	70	Section 5.6.9	Because the answer to Question A is "no", include a statement about current exposure pathways to complete the justification for protectiveness in the short term. **Response:** The second bullet will be revised as follows: *"There are no complete pathways for human exposure to groundwater. ICs are in-place to ensure that contaminated groundwater will not be used until the cleanup goals are attained."*
21.	79	Section 5.7.5	The first line of the fourth paragraph states "Seven of the 13 monitoring wells sampled contained one or more COC above the cleanup goals." Per the data and review provided in Attachment 10 regarding OU-4 Landfill, nine out of 13 wells contained one or more COC above the cleanup goals.

			Please explain the discrepancy and correct the statement to show the right number of wells if necessary. **Response:** Eight of 13 monitoring wells sampled during the most recent event (October 2014) contained COCs above the cleanup goals. The discussions in Section 5.7.5 and Attachment 10 will be revised as follows, *"8 of 13 monitoring wells sampled since October 2014 contained COCs above the cleanup goals."*
22.	78	Section 5.7.5	The last sentence of the fourth paragraph on Page 78 states *"The increasing TCE concentrations at this location may be a result of abiotic transformation of 1,1,2,2-TCA [1,1,2,2-trichloroethane] or a residual TCE plume from beneath the landfill."* The 1,1,2,2-TCA concentration trend at well AP-5589 seems to mirror the TCE trend at least for the last few sampling events, i.e., the 1,1,2,2-TCA concentration is rising in conjunction with TCE. This would indicate that the TCE concentrations are likely not increasing as a result of 1,1,2,2-TCA degradation, which should be decreasing for that correlation. Please provide more basis for this conclusion or revise this statement to focus just on the residual TCE source. **Response:** Abiotic transformation of 1,1,2,2,-PCA to TCE is documented in EPA/600/R-98/128 (Table B4.1). The statement on page 78 provides a plausible explanation for the observed TCE concentration increases. The monitoring data indicates that TCE has exceeded the 5 µg/L cleanup goal on two occasions since 1997, most recently in November 2009. TCE concentrations in groundwater have been stable since 2009. The estimated time frame to reach the cleanup goals at the OU-4 Landfill is 70 years, or by 2067. Providing possible causes for the presence of TCE in well 5589, either abiotic transformation of 1,1,2,2-PCA and/or a residual source, is unwarranted at this time. The statement *"The increasing TCE concentrations at this location may be a result of abiotic transformation of 1,1,2,2-TCA [1,1,2,2-trichloroethane] or a residual TCE plume from beneath the landfill."* will be removed.
23.	78	Section 5.7.5	The MAROS trend analysis uses all the data post-ROD from 1996 onward. While this provides a good long term analysis, short term trends could be missed. For example, 1,1,2,2-TCA in monitoring well AP-5588 shows a decreasing trend from July 1997 (1,700 micrograms per liter [ug/L]) to October 2014 (1,300 ug/L). However, if a shorter term data-set is used starting from July 2011 (890 ug/L) to October 2014, a rising trend can be observed contrary to the long-term trend. The short term evaluation allows for an analysis of changes that occurred over the last five years, like in the example above. A shorter term MAROS trend analysis using the five-year

			timeframe of the report can provide useful insights as to the progress of the remedy. Please provide the most recent 5-year MAROS trend analysis in addition to the full timespan MAROS analysis and provide an assessment of the results. This approach should also be taken for other sites where there is a greater than 10-year history of groundwater monitoring being used to assess remedy performance. **Response:** The estimated time frame to reach the cleanup goals at the OU-4 Landfill is 70 years, or by 2067. Additional trend analysis using shorter time frames is unwarranted at this time.
24.	81	5.7.6.3	Question C: Include analysis for 1,4-dioxane due to association with TCE and increasing TCE trends in intermediate and deep wells. (1,4-Dioxane is associated with TCE and 1,1,1,-DCA , however this site has TCE and 1,1,2-TCA). **Response:** See response to general comment #15. A recommendation will be added to the five-year review to assess the Landfill site for 1,4-dioxane.
25.	98	Section 5.9.5	The following statement is made in the second paragraph of the Sparge Curtain Area subsection: *"These results indicate that the contaminant plume is not migrating into the Chena River and that the boom is effectively containing sheen releases."* However, an intermittent sheen has been observed on the Chena River. Please clarify whether the sheen was observed only in the area within the boom or if it was also observed outside the boom area. If the sheen was also observed outside the boom indicating that the boom may not be functioning as intended, please provide a statement regarding the effectiveness of the boom, suggest remedial actions to prevent plume migration in Chena River, if needed, and re-evaluate the protectiveness statement in Section 5.9.9, Protectiveness Statement. **Response:** According to the final 2015 Monitoring Report for OU-5, sheen has only been observed within the boom area. The five-year review report will be updated to include this information.
26.	98	Section 5.9.5	The first bullet point under the West Quartermaster's Fueling System (WQFS) Source Area subsection states *"… The benzene trends were generally stable or decreasing and there is no evidence of benzene migration. GRO concentrations continue to decrease and diesel range organics (DRO) concentrations remain stable in this area."* Monitoring wells OU5-TW2, OU5-TW6, OU5-TW7, OU5-TW9, and OU5-TW10 appear to show an increasing trend for DRO and/or benzene concentrations. Please substantiate the called out statements about the benzene and DRO trends using MAROS or other suitable statistical software. If concentrations trends are increasing

			in some of the wells, please discuss these increases and optimizing or augmenting remediation to address these increases and revising the protectiveness statement in Section 5.9.9, Protectiveness Statement. **Response:** Information from the most recent OU-5 monitoring report (2015) will be included in Attachment 10 to substantiate the statements.
27.	100	Section 5.9.8	The first bullet in Section 5.9.8, Recommendations for follow-up Actions, states *"Implement measures to avoid future displacement of the Chena River Boom (e.g., increase height of the support posts)."* This implies that the boom has been displaced previously. Please add data to Section 5.9.4, Site Inspection, or another appropriate Section 5.9 subsection, to describe any past incidents where the Chena River boom has been displaced. **Response:** The first bullet of Section 5.9.7 (Issues) describes displacement of the Chena River boom in 2014.
28.	106	Section 5.10.5	The first paragraph in the Data Review section states *"The 2015 analytical data for six wells sampled in Flowpath D (AP-7490, AP-7752, AP-7753, AP-7754, AP-7755, and AP-7823) showed DRO concentrations below the cleanup goal (Figure 5-11 and Attachment 10). The 2012 results for well AP-7751 indicate that all ROD COCs analyzed were below the cleanup goals (residual range organic [RRO] and (2-chlorethyl)ether were not analyzed)."* Attachment 10 also indicates that only DRO was analyzed in the latest sampling round. However, sufficient explanation has not been provided for why only DRO was sampled instead of all the COCs listed in the ROD. Please provide the basis for sampling only DRO in the latest sampling event. **Response:** The only COC that exceeded the cleanup goals after the treatment system was shut down was DRO. Notes from the Winter 2015 FFA Meeting document a decision to only sample the Flowpath D wells for DRO in 2015.
29.	109	Section 5.10.9	The third bullet in the section for the Protectiveness Statement states "Occurrences of sheen in the Chena River have decreased." No evidence has been provided to substantiate this statement either in the Site Inspection or Data Review sections. Please provide the evidence for this statement in one of the sections mentioned above. **Response:** Sheen observations at individual stations along the boom are summarized in Table 3-6 of the final 2015 Monitoring Report for OU-5. It provides evidence that NAPL migration to the

			river has decreased since start of the remedial action. This information will be added to the five year review report.
30.	112-113	5.11.4	Site land use has changed with aboveground storage tank removal. **Response:** The last sentence of Section 5.11.4 will be revised to indicate that the above ground storage tanks were removed.
31.	114	5.11.9	The Remedy in the ROD was ICs. We don't have a decision document that allowed for soil removal. How to deal with this? **Response:** Acknowledged, the remedy in the OU-5 ROD was institutional controls. Contaminated soil excavation would be conducted under the 2-Party Agreement. The five-year review site inspection and most recent institutional control inspection report indicate that there was no recent evidence of unauthorized use of the site groundwater, no soil disturbing activities, and warning signs were present. This indicates that the remedy is functioning as intended by the ROD (RAO is to limit human and terrestrial exposure to lead contaminated soil). The protectiveness determination will be changed to "protective" as noted below: *The remedy at OU-5 Remedial Area 1A (BHTF ASTs) is protective of human health and the environment because:* • *ICs are in place to limit human and terrestrial receptor exposure to lead contaminated soil* • *There is no evidence of unauthorized installation or use of groundwater wells, no soil disturbing activities, and warning signs are intact.*
32.	115	Section 5.12.1	The first paragraph of this section provides the former title of the site as the "Explosives Ordnance Detonation Area." It should be noted that the original title of the area was the "Explosive Ordnance Disposal (EOD) Range." In addition, it states that, *"The site was used by the U.S. Army from as early as the mid-1960s to as late as the mid-1980s for open burning/open detonation of unexploded ordnance and dud ordnance, unused propellants (black powder), rocket motors and small-arms ammunition."* This statement is also presented in the Executive Summary. While this is likely the case, the following should be noted: • The term "unexploded ordnance" includes "dud ordnance." • The "unused propellants" disposed included propellants other than black powder.

			• All of the unserviceable ammunition stored at the ammunition supply point that was not retrograded to the Continental United States for renovation and/or disposal was destroyed at the site, not just propellants, rocket motors and small-arms ammunition. Please revise the FYR to correct the issues noted in this section, Section 5.12.1.3, the Executive Summary, and at any other locations where the same or similar information is provided. **Response:** No remedial actions were identified for the OB/OD site in the OU-5 ROD and the site received a no further action decision. While the five-year review will continue to present only the currently known information outlined in the document provided for regulatory review, the Army will perform a file review to collect additional information on the site. The discussion in the current five-year review report reflects information in the CERCLA and RCRA records, as well as additional observations and limited geophysical work conducted at the site. (Also see Army response to General Comment #s 11 and 12.)
33.	116	5.12.1.2	This section states that according to DoD policy, the OB/OD Area cannot be used for other purposes or transferred unless clearance techniques ensure the area is free of UXO and related hazards. This section must also state that the unit must also be closed in accordance with the RCRA permit before it is used for other purposes or transferred to the general public. **Response:** The requested change will be made
34.	116-117	5.12.1.3	The second paragraph refers to a site visit. The date of the site visit must be specified. The second paragraph also refers to the collection of soil samples. The number and location of these samples, the sampling and analysis plan, sampling report, analytical data and field notes from the sampling must be referenced. This section states that human access to the area is "*extremely restrictive*" and that "*evaluation of the site indicated that there were no complete exposure pathways for contaminants and that the contaminant levels were found to not pose an unacceptable risk to human health or the environment*." These were assumptions that were made at the time the ROD was signed. However, the recent failure of institutional controls and discovery of extensive subsurface buried munitions at the nearby Tanana River Site have called these assumptions into question. Without further investigation the assertion that there is no unacceptable risk to human health and the environment is unverifiable. The Five Year Review must address this data gap and new information. **Response:** Available historical files will be reviewed for more information on the site visit performed on the OB/OD area. The requested details will be added to the report if available.

			See the OU-5 portion of the Army response to General Comment #17 and to General Comment #s 11 and 12. The Army asserts that the discovery of the Tanana River site has no direct bearing on the OU-5 OB/OD site.
35.	117	5.12.1.5	This section refers to the OB/OD Area as a RCRA regulated unit located within an operational range in the past tense. The area is still a RCRA regulated unit and is still located within an operational range. It will remain a RCRA unit until it is clean closed in accordance with an updated closure plan, which EPA requested of the Army in a letter dated December 18, 2014. Revise this section to state that the OB/OD Area is a current RCRA regulated unit. It is noted on the Inspection Form for OU5 (page A4-28) that no permits are noted as required. This is incorrect for the OU5 OBOD unit, which provides a specific example of the inaccurate information presented when the site inspections are combined within an OU. **Response:** The Army will clarify that the OB/OD site is a RCRA regulated unit in Section 5.12.1.2 (Land and Resource Use). Following numerous discussions between EPA and the Army, the Army responded to EPA's December 18, 2014 in a letter dated February 1, 2016.
36.	117	~~5.12.1.4~~ 5.12.3	Progress Since the Last Five Year Review references the fourth Five Year Review, which is this current assessment. Please revise this section as there is new information (the nearby Tanana River OBOD site, previously unknown to the Army), expansion of a road to the OU5 OBOD, and a major failure of IC to restrict access within 1000 ft of the OU5 OBOD unit. **Response:** The 1st sentence of Section 5.12.3 will be revised to reference the 3rd five-year review. The discovery of a new source area is not an IC failure; the Army asserts the Tanana River site has no direct bearing on the OU-5 OB/OD site. Also see the OU-5 portion of the Army response to General Comment #17 and to General Comment #s 11 and 12.
37.	118	5.12.5	This section asserts that "*after review of the OU-5 ROD, the RCRA Permit and the Interim Closure Plan, no information has been received to suggest that no action is no longer protective of human health and the environment*." The information in the ROD, Permit and Closure Plan are not sources of new information about current conditions. The new information is the failure of institutional controls and the discovery of subsurface munitions at the Tanana River site. This information is discussed briefly in section 5.12.6, Current Status of the Site. The Data Review section must be revised to include recent information about the OB/OD Area. The ERDC, CRREL 2015 Safety Clearance Report, discussed in this section, was for the limited purpose of determining whether the area was suitable as a staging area for work at the Tanana

			River Site. It did not investigate the entire OB/OD Area and did not show that the current remedy in place is protective of human health and the environment. This section must clearly state the limited purpose of the Safety Clearance Report. **Response:** See the OU-5 portion of the Army response to General Comment #17 and to General Comment #s 11 and 12. The Army asserts the discovery of the Tanana River site has no direct bearing on the OU-5 OB/OD site; therefore, there was not an IC failure at the OU-5 OB/OD site. In addition to criminal prosecution of individuals who trespassed at the Tanana River munitions area, the Army increased controls at the OU-5 OB/OD area. The Army will discuss the increased controls put in place at the range following the discovery of the Tanana River site, and will indicate the CRREL report covering the location of the OU-5 OB/OD was for the purpose of clearing the area to ensure safety of workers and equipment.
38.	118	Section 5.12.6	The Current Status of the Site states that the Fort Wainwright Range Control has reviewed the range controls that are in place, including signs, patrols and an added gate. The new measures are not clearly specified (for example, the frequency of patrols and the area being patrolled) and it is not clear how effective they will be, especially since the boundaries of the unit and extent of the subsurface hazard are unknown. The conclusion that institutional controls are effective and indicate continued delay of closure of the OB/OD Area is appropriate is not supported by the reasons listed and must be revised. The 2nd paragraph in the Current Status section states that "*no new RCRA or munitions rules have been promulgated that would change the unregulated status of intended use munitions or UXO on the operational range*." This statement is inaccurate. In 1997 the military munitions rule clarified EPA's approach to active ranges, clarifying that non-range OB/OD units are not protected by the active range exemption; and in March 7, 2000 the DOD-EPA Principles Agreement stated that all previous geophysical investigations cannot be used for any RCRA or CERCLA no further action or cleanup determinations, except in the very rare instances where the previous efforts complied with the Principles. Revise this section accordingly. The 2nd paragraph in the Current Status section also states "*the ICs required for the OB/OD Area are a result of the regulated unit being located within an operational range, which is and will continue to be subject to the deposition of intended use munitions that may pose an explosive hazard*." However, elsewhere in the document it states that no UXO has been discovered in the area. This area is located on the edge of the safety fan of the small arms firing range. Although it is important to control access because of the potential for new UXO to impact the area, the greater

			hazard by far is the munitions that are potentially in the subsurface due to the open burning and open detonation activities. The IC's required for the area because of the existence of a RCRA regulated OB/OD unit are independent from and in addition to the controls necessary for the small arms firing range. The statement that the area "*continues to be subject to deposition of munitions and munitions constituents*" is misleading, as any new deposition in the area on the surface would be subject to normal range clearance procedures. The subsurface munitions which were the result of historical open burning and open detonation were the main concern at the Tanana River Site and are the main concern at the OU-5 OB/OD Area as well. Revise this section to distinguish the OB/OD Area from the operational small arms firing range. This last sentence in this section states that, *"Therefore, the current ICs are sufficient to protect human health and the environment, and the delay of closure of the OU-5 OB/OD unit continues to be appropriate."* This is correct if the current ICs restrict intrusive activities that may extend past the approximate depth that would allow contact with subsurface burials. Please review the ICs and ensure that this level of intrusion is prohibited. **Response:** See the OU-5 portion of the Army response to General Comment #17 and to General Comment #s 11 and 12. The requested additional information on improvements made to the OU-5 OB/OD ICs will be documented in the five-year review. The Army maintains that the institutional controls at the OU-5 OB/OD site are effective and that a continued delay of closure of the OB/OD area is appropriate. No evidence has been reviewed specifically for this site that would indicate otherwise. The second paragraph in the current status section text will be revised to state that no new RCRA or munitions rules have been promulgated in the last five years that would change the unregulated status of intended use munitions or UXO on the operational range. Additional information has been integrated into the ARAR evaluation to specifically address the OU-5 OB/OD area. Past investigations associated with the OU-5 OB/OD used what was known about practices at this site and this type of site to define the investigation. The limited geophysical work conducted by CRREL for purposes of safety clearance confirmed subsurface munitions are not present at the site. Additionally, maps contained in the RCRA and CERCLA documents indicate the location/boundary of the OU-5 OB/OD area, which is within an operational range. The Army acknowledges that additional site mapping and investigation may be required upon RCRA closure.

			The ICs required in the OU-5 ROD include monitoring and control of access to the site. Since the ICs restrict access to the site, they also restrict access to subsurface soils. These restrictions will be outlined in the site-wide IC program to be updated by the Army.
39.		SECTION 6	The issues in Tables 6-1 and 6-2 may change with evaluation of the ROD comingled DRO/GRO/RRO contaminants and discussions on protectiveness determinations. Tables 6-1 and 6-2 comments are based on EPA review of the draft FYR. **Response:** All recommendations in Tables 6-1 and 6-2 will be reviewed and revised, if necessary, based on the Army responses to USEPA comments.
40.		Table 6-1	Add to the table issues that affect protectiveness (future or deferred): OU1 801 Drum Burial - data collection for VOCs in wells near housing for VI evaluation OU2 DRMO - 1,4-dioxane has not been assessed OU3 - DCA plume migration at OU3 Remedial Area 1A; TMB toxicity levels OU4 Landfill – 1,4-Dioxane has not been assessed OU4 Fire Training Pits – PFAS contaminants have not been assessed for exposure pathway OU5 WQFS – potential migrating benzene plume; use of the absorbent boom to mitigate sheen on the Chena is not sustainable as a long term remedy OU5 OBOD – better characterization required for hazardous constituents and unit boundaries, define site specific ICs From Table 6-2 Move the site-wide recommendation for an SOP for all LUCs/ICs on FWA to Table 6.1. LUCs/ICs are integral to the protectiveness of the remedy. Change the follow-up actions to read "Update the site-wide SOP to include all LUCs/ICs required throughout FWA." **Response:** Any changes to Table 6-1 will be in accordance with the response to General Comment #17.
41.		Table 6.2	Add to Table 6-2: OU1 801 Drum Burial: Increase sampling frequency at AP-10042 to get data for next 5 year review to help determine groundwater attainment of cleanup levels.

			OU2 Bldg 1168: Develop an iRACR to document remedial action complete under CERCLA. Transfer management of the Bldg 1168 GW monitoring to the 2 party program. If the site retains IC restrictions, then the 5YR must be conducted to evaluate that component of the remedy. OU3 Area 1B: Re-evaluate GW monitoring after 'petroleum and other contaminant removal' from AST tank removal under the 2-party agreement. OU4 Coal Storage Yard: Develop an iRACR to document remedial action complete under CERCLA. If the site retains IC restrictions, then the 5YR must be conducted to evaluate that component of the remedy. Remove from Table 6-2: OU5 Area 1A: Recommendation is to remove 'lead contaminated soils under the 2 party agreement'. This is not a 3 party CERCLA removal so remove this issue from the Table ? **Response:** OU1 801 Drum Burial Site: The groundwater monitoring frequency is every five years and the next episode is scheduled for 2020. The RPMs also agreed to collect biennial samples from monitoring wells AP-10042 and AP-7163 in 2017 and 2019. This data will enable determination of cleanup goal attainment in the next five-year review report (2021). OU-2 Bldg. 1168 Leach Well: Table 6.2 and Section 5.2.8 (Recommendations for Follow-up Actions) will include a recommendation to prepare an interim remedial action completion report. The recommendation will indicate that petroleum contamination is present at the site and the process for evaluating/remediating petroleum contamination is provided in the 2-Party Agreement. OU-3 Remedial Area 1B (BHTF): The requested recommendation will be added to Table 6-2 and Section 5.4.8 (Recommendations for Follow-up Actions) OU-4 Coal Storage Yard: Table 6.2 and Section 5.8.8 (Recommendations for Follow-up Actions) will include a recommendation to prepare an interim remedial action completion report. OU-5 Remedial Area 1A (BHTF ASTs): The recommendation will be removed from Table 6-2 and Section 5.11.8.
42.		6.2	Protectiveness statement suggestions provided in general comment #17 **Response:** Any changes to the protectiveness statements in Section 6.2 will be in accordance with the response to General Comment #17.

43.		FIGURES	All figures are missing the extent of historic and current plume boundaries. Figure 2-1 missing is OU6 **Response:** OU-6 will be added to Figure 2-1. All figures except Fig 5-13 are missing IC boundaries. **Response:** IC boundaries will be added to the figures. Figure 5-9 Coal Storage Yard has a remedial area boundary – is this the IC boundary? **Response:** The IC boundary for OU-4 Coal Storage Yard will be identified on the figure. Add a figure for OU5 OBOD. Define IC boundaries. **Response:** Available figures for the OU-5 OB/OD site will be reviewed and included as appropriate in the five-year review. The Army acknowledges additional mapping of the site may be required upon RCRA closure.
44.	-	Attachment 1 Figure 5-3	Figure 5-3 only shows five of the six subareas at the OU-2 DRMO Yard. Please revise Figure 5-3 to depict all six subareas associated with the OU-2 DRMO Yard. **Response:** There are six subareas at the OU-2 DRMO Yard. However, DRMO-6 was an area where surface water and sediment samples were collected from the "V" channel and drainage ditches around the compound. It was issued a "no further action" declaration and dismissed very early in the program. Therefore, it not shown on Figure 5-3.
45.	-	Attachment 1 Figure 5-4	The discussions in the text regarding OU-3 Remedial Area 1B wells distinguish between wells screened in bedrock and in alluvium, but Figure 5-4 does not differentiate between bedrock and alluvium wells (e.g., different symbols, different colored well labels, etc.). Please revise Figure 5-4 to differentiate between bedrock and alluvium wells. **Response:** Figure 5-4 will be revised to differentiate between bedrock and alluvium wells.
46.		Attachment 2	The Documents Reviewed section contains duplicate references (e.g., Marsh Creek 2015, Marsh Creek 2015b draft and final respectively, OU6 RDRA US Army & OU6 RDRA USACE), draft reports which have been finalized (e.g., most of the 2014 OU reports and IC report, OU1, OU2 and OU5 for 2015). Please update the documents reviewed for the most current reference. If a final version was available but not used, that should be noted.

			Response: Marsh Creek 2015a and USACE 2015 will be deleted. The five-year review report will be updated to reflect more current monitoring reports. Add the OU6 ROD **Response:** The OU-6 ROD reference will be added. Add the 1997 Military Munitions Rule **Response:** The 1997 Military Munitions Rule will be added. Add the 2013 RCRA Permit **Response:** The RCRA Permit will be added. What is this document if not the OU4 ROD? How does it not have a date? *U.S. Army No date. Decision Document for Fire Training Pits, Operable Unit 4.* **Response:** The Decision Document for Fire Training Pits is a separate document that was included in the OU-4 ROD as Appendix A. It is not dated.
47.		Attachment 3	The document summaries are well done and useful. The following clarifications or corrections should be made: • OU1 MCLs for dieldrin and aldrin – there are no new federal MCLs, clarify if these are state MCLs • OU3 Area 1B – shouldn't receptors be residential (including off –base in addition to Army with the church wells downgradient). • OU5 Area 1A lists groundwater as the media of concern. Isn't this a soil contaminant? There are RAOs associated with GW and Chena River. Add a summary for OU5 OBOD **Response:** • OU-1 - The MCLs for aldrin and dieldrin are State of Alaska (18AAC Table C). This information will be added to the summary table • OU-3 Remedial Area 1B – the ROD (Section 6.1.4, page 77) indicates that potential receptors at the Tank Farm Source Area [that exceeded the ICRL and/or HI] include

			downgradient users (the two churches) and [users of the] Class A municipal drinking water wells. The summary table will be corrected to include this information. • OU-5 Remedial Area 1A – correct, the medium of concern is groundwater. The summary table will be corrected to include this information. • OU-5 OB/OD Area – Summary tables will be added
48.		Attachment 4	Numerous inconsistencies or errors in these forms. Section II, 3. of the form: No response isn't appropriate for the site inspection. Regulators were not given adequate notice for the date of the inspection. Not present is more accurate. **Response:** Requested change will be made ADEC representative may have been Guy Warren, not Guy Warner. Deb Calliouet retired in July 2015. **Response:** The ADEC representative was Dennis Shepard. The five-year review report will be revised to reflect this. Section III, On-site Documentation. Many remedies had AS/SVE or product recovery systems. Where is the O&M documentation and product disposal records. NA does not seem appropriate. **Response:** The systems were not operated during the 4th five-review period (i.e. September 2011 to present) and reference to these records is unnecessary. Section X, Other Remedies. Are new injection wells documented in the inspection due to treatability studies at OU2, OU3, OU5. **Response:** The new injection wells haven't been documented on the inspection forms. OU3, Section 6, D.3. Wasn't a new gate installed on Lazalle Road for the Arctic Games? **Response:** Yes, this information will be added to the Site Inspection Form. OU4 Landfill. Isn't there maintenance on the Landfill Cap? Maintenance is marked NA. No permits are selected. This should be permitted by ADEC as a Solid waste site. **Response:** The inspection checklist will be revised to include this information.

			OU4 Landfill and Coal Storage, Section XI,D. Statement to optimize by discontinuing FYR at Coal Storage. You don't to discontinue 5YR if ICs are still a component of the remedy unless you can prove UU/UE. **Response:** All cleanup goals and RAOs identified in the OU-4 ROD have been attained. This site has limitations solely due to its use a coal storage yard. It meets the unlimited use and unrestricted exposure criteria identified in the ROD. LUC/ICs pursuant to the ROD and five-year reviews should be discontinued. OU5 III,4. Add the RCRA permit. **Response:** Requested change will be made OU5 V.A.1. *Access is controlled to all sites by installation fencing*. This is an incorrect statement as the southern boundary of Fort Wainwright along the Tanana River is not fenced. **Response:** This statement will be removed. OU5 V.C. EPA disagrees in general with the ICs as effective for OU5 due to the Tanana River trespass event within 1000 ft of OU5 OBOD. **Response:** Comment noted. The discovery of a new source area is not an IC failure; the Army asserts the Tanana River site has no direct bearing on the OU-5 OB/OD site. Also see the OU-5 portion of the Army response to General Comment #17 and to General Comment #12. OU5 VI.A – significant change to the road at OU5 OBOD since the last FYR should be noted. **Response:** Requested change will be made OU6 V.D.2. Land use has changed at the site. Residential occupation began at the OU6 in July 2015. **Response:** Requested change will be made
49.	A4-4, A4-10, A4-16, A4-22, A4-30, and A4-36	Attachment 4	The Inspection Checklists provided in Attachment 4 do not clearly indicate whether there have been violations of ICs. Section V, Part C, Item 1 of the Inspection Checklists states "Violations have been reported" and checks "Yes," but it is unclear whether this indicates that yes, reporting is occurring as required or yes, violations have occurred. Please revise the FYR to clarify whether there have been violations of ICs. If so, please revise the FYR to summarize the violations and to make recommendations regarding how violations will be prevented.

			Response: The inspection checklists will be updated, if necessary, to discuss any IC violations noted in the IC inspection reports and five-year review inspection.
50.	A4-9	Attachment 4	"Gates secured" is marked under Section V, Part A, Item 1, but the remarks indicate that "Access in controlled by installation fencing." Please revise the FYR to clarify whether there is a gate present. If not, please ensure that "N/A" is marked on future Inspection Checklists. **Response:** The inspection checklist will be reviewed and corrected for any discrepancies or omitted information.
51.	A4-11	Attachment 4	Section IX, Part E, Item 1 notes that "Monitoring wells in the vicinity of the DRMO yard observed damaged due to frost heaving," but does not identify which wells are damaged. Please revise the FYR to clarify which wells at the DRMO Yard have been damaged and indicate which wells will be repaired and/or replaced. **Response:** The inspection checklist will be reviewed and corrected for any discrepancies or omitted information.
52.		Attachment 5	No photographs from the inspection at OU5 OBOD. **Response:** See response to General Comment 11. No overview for where the OU6 photos were taken. **Response:** An overview figure will be provided that shows the locations and orientation of OU-6 photographs.
53.		Attachment 6	EPA interview form submitted July 27, 2016. **Response:** Acknowledged, it will be added to the final report.
54.	A7-2 (Table) A7-12 A7-15	Attachment 7	There is no discussion of the OB/OD Area, which is a RCRA-regulated unit and has a RCRA permit. In accordance with the permit, submittal of an updated closure plan was requested by EPA on December 18, 2014. A discussion of the OB/OD Area must be included in this section of the ARAR evaluation. **Response:** Pursuant to the OU-5 ROD, the five-year review report will evaluate the status of RCRA rules and regulations for military munitions ranges and unexploded ordnance to determine whether additional RCRA requirements must be met. This will be included in Attachment 7 and results of the evaluation will be discussed in the main section of the report.

55.		Attachment 7	Table A-7.1. This table proposes a current remediation goal that is One Order of Magnitude higher than cleanup goals in the ROD. The state may have promulgated a groundwater cleanup level, but the cleanup goal has not changed unless documented in a ROD Amendment or Explanation of Significant Difference. **Response:** Table A-7.1 will be checked against the ROD cleanup goals. Any discrepancies will be corrected.
56.	A8-10ff	Attachment 8	Revise the OU5 Risk Assessment and Toxicology Evaluation for OU5 after completing a more accurate characterization of hazards at the OU5 OBOD site. **Response:** The OU-5 ROD did not select a remedy for the OB/OD site and determined that no action was required to address the OB/OD site. Therefore, there are no exposure assumptions, toxicity data, or cleanup levels to evaluate in Attachment 8.
57.		Attachment 8	Placeholder for risk assessor comments. **Response:** None
58.		Attachment 10	The annual groundwater monitoring reports have done a comprehensive job at evaluating groundwater trends. In future FYR, please utilize as many approved and finalized annual reports for the groundwater analysis. It is noted in this FYR, OU2, OU3, and OU5 used data and analysis from groundwater reports. The OU1 annual report was finalized in concert with production of this draft FYR. Please ensure the OU1 trend analysis conclusions in the FYR match those approved in the OU1 2015 Groundwater Monitoring Report. **Response:** Acknowledged OU4 annual reports from 2014 and 2015 did not include trend reports. **Response:** Correct, the discussion indicates that trend analysis was performed to augment and verify assessments provided in the annual reports. It does not indicate that trend analysis was performed in the reports.
59.	-	Attachment 10 Figure 3-2	Figure 3-2 indicates that there are no monitoring wells located north of wells AP-6331 and AP-10042MW or west of well AP-10042MW to define the extent of the northern dieldrin plume. There are also no monitoring wells located west of well AP-6631 to define the extent of the southern dieldrin plume. In addition, concentrations of dieldrin in well AP-6631 were above cleanup levels in 2005, but the well has not been sampled since then. Lastly, the figure does not denote the direction of groundwater flow. Please revise the FYR to acknowledge the data gaps at

			the OU-1 801 Drum Burial Site and to discuss how these data gaps impact the evaluation of plume stability. Please also recommend that well AP-6631 be sampled in future monitoring events. Lastly, please ensure the figures in the FYR that display groundwater data also depict the direction of groundwater flow. **Response:** The 2015 OU-1 Groundwater Monitoring Report includes a recommendation to sample wells AP-6630 and AP-6631 for pesticides during future monitoring events. Spatial moment analysis, conducted in the OU-1 2010 and 2015 monitoring reports, indicates that the dissolved dieldrin mass has been stable and no trend has been identified for location of the center of mass. Piezometric surface maps indicate that a groundwater divide, trending north-south, is present at the site. Groundwater in the eastern portion of the site discharges to the Chena River, while groundwater in the western portion of the site flows west/northwest. The location of the divide varies with river stage. The five-year review report will be updated to include this information. Potentiometric surface maps, from the monitoring reports, will be added to Attachment 10.
60.	-	Attachment 10 Figure 2-2 and Table 5-5	Table 5-5 indicates that well AP-5751 is upgradient, well AP-10037MW is within the source area, and well AP-6809 is downgradient, but Figure 2-2 shows that all three wells are located downgradient of the source at the OU-2 Building 1168 Leach Well Site (i.e., the former leach well). In addition, given the limited monitoring well network, it is unclear whether concentrations have fallen below cleanup levels or whether ISCO injections have pushed the plume downgradient of the monitoring wells. Please revise the FYR to resolve the discrepancies regarding the well designations for the OU-2 Building 1168 Leach Well Site (e.g., upgradient, source area, etc.). Please also revise the FYR to discuss whether concentrations have fallen below cleanup levels or whether it is possible that ISCO injections have pushed the plume downgradient of the monitoring wells. **Response:** Table 5-5, Figure 2-2, and Figure 5-1 were taken from a contractor's report (pdf) and cannot be edited. The ISCO treatability study was conducted in 2010 and included in the last five-year review. The previous review does not contain any additional information that would allow for an evaluation of dispersion during the injection. Groundwater monitoring data was reviewed and no plume migration was observed in the two nearby monitoring wells. All available information will be added to the five-year review.
61.	-	Attachment 10 Figure 2-4	Figure 2-4 indicates that several wells at the OU-3 Remedial Area 1B have not been sampled recently. For example, concentrations of 1,2-DCA, 1,2-EDB, and benzene at well AP-7813

			exceeded the cleanup levels in 2013, but no sample data is presented for 2014 or 2015. Another example is well AP-7528. Concentrations of 1,2-EDB and benzene exceeded the cleanup levels in 2010, but the well has not been sampled since then due to poor recharge. Well AP-7528 should be recommended for replacement. Please revise the FYR to recommend sampling of all wells where concentrations have been above cleanup levels but that have not been sampled recently, or provide an explanation in the FYR for why sampling of these wells is not required. **Response:** The 2014 OU-3 monitoring report recommended sampling bedrock well AP-8424 as a replacement for AP-7813. The 2012 OU-3 monitoring report (Figure 2-10) indicates that AP-7528 was eliminated from the sampling program. Well AP-7813 is located within 10 feet of AP-7528 and has been used in lieu of AP-7528.
62.	-	Attachment 10 Figure 3-1	Benzene exceeds the cleanup level at wells VPA-MP1, VPA-MP2, VPA-MP5, AP-6064, and AP-6065, but no benzene plume(s) is depicted at the OU-3 Remedial Area 2 (Valve Pits A, B, and C). Please revise the FYR to depict the extent of the benzene plume(s) at the OU-3 Remedial Area 2. **Response:** Figure 3-1 was taken from a contractor's report (pdf) and cannot be edited.
63.	-	Attachment 10	For OU-3 Remedial Area 3, a figure showing the latest data up to 2015 has not been provided. Only Figure 4-1 from the 2010 OU3 Monitoring Report has been provided which does not present the latest monitoring data from 2015. Please provide an updated figure that also presents the latest monitoring data. **Response:** Attachment 10 will be updated with figures/tables from the most recent monitoring reports.
64.	-	Attachment 10	Table 5-19 does not present any notes explaining notations and highlights. Please update Table 5-19 with notes explaining highlights, notations, and acronyms. **Response:** Table 5-19 was taken from a contractor's report (pdf) and cannot be edited. The OU-3 monitoring documents will be checked for a better version of this table. It will be replaced, if one is available.
MINOR COMMENTS			
1.	xvii	OU3 Remedial Area 1B	Inconsistent use of acronyms. 1,2 DCA should be spelled out the first time and then acronymed later. Later on page xviii it's spelled out. **Response:** Requested change will be made

2.	20	Section 5.1.2.2 and Attachment 1 Figure 5-1	According to Section 5.1.2.2, "Currently, eight of the 16 monitoring wells are monitored" at the OU-1 801 Drum Burial Site, but Figure 5-1 only depicts 11 well locations. Please revise Figure 5-1 to show all 16 monitoring wells at the OU-1 801 Drum Burial Site. **Response:** Figure 5-1 will be cross-checked against Section 5.1.2.2. Any discrepancies will be corrected.
3.	37	Section 5.3.3	The second to last bullet point on page 37 states that "beginning in 2014, the sampling data was analyzed using a Groundwater Statistics Tool developed by the USEPA" and concludes, "As a result of this evaluation, a second ISCR [in-situ chemical reduction] injection was completed in 2011 in the DRMO-4 subarea;" however, it is unclear how an analysis conducted in 2014 impacted an injection completed in 2011. Please resolve this discrepancy. **Response:** The second bullet will be revised as follows, *"Following each annual monitoring event, groundwater data were presented in annual monitoring reports and used to perform LTMO analysis, which included evaluation of contaminant trends, plume stability, monitoring well redundancy, and sampling frequency. As a result of this evaluation, a second ISCR injection was completed in 2011 in the DRMO-4 subarea as part of a treatability study initiated in 2009. Beginning in 2004, the sampling data was analyzed using a Groundwater Statistics Tool developed by the USEPA.*
4.	116	Section 5.12.1.3	The text in the second paragraph refers to "detonation (impact) craters." These two types of craters are not the same and they result from different activities and they do not have the same general characteristics. The detonation crater results from the intentional (and usually repetitive) detonation of explosive charges, while the impact crater results from the impact detonation of fired ordnance. Please correct this statement. **Response:** The statement will be corrected.
5.		Attachment 3	Typo in OU6 COC summary for 1,2,3-TCP. **Response:** The typo will be corrected.

REVIEW COMMENTS **PROJECT: Fort Wainwright**
DOCUMENT: DRAFT Fourth Five-Year Review Report for Fort Wainwright

USACE 25Aug16 meeting notes & proposed changes

ALASKA DEPT. OF ENVIRONMENTAL CONSERVATION	DATE: July 7, 2016 REVIEWER: Dennis Shepard PHONE: 907-451-2180	Action taken on comment by:

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A – accepted D – disagree P - pending W - withdrawn	ARMY RESPONSE	ADEC/EPA RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)	ARMY RESPONSE
1	Xxi, Table 5-3 & Table 5-4	Text states: "All RAOs have been attained at the Building 1168 Leach Well site." RAOs for OU-2 include 'Restore groundwater to drinking water quality." Based on the recommendations in the 2015 monitoring report for the former Building 1168, DRO is still being evaluated. The site has been recommended for moving the site from the 3 party program to the Two party program. Based on these recommendations the RAOs have been met for contaminants other than DRO. Please describe the remaining concentrations, trends and plans to move the site to the Two Party for further monitoring.	A (with language added to the FYR report that acknowledges the presence of DRO in groundwater)	COCs and remediation goals for groundwater identified in the OU-2 ROD for the Building 1168 Leach Well site include: • Benzene (5.0 µg/L) • Trichloroethene (5.0 µg/L) • Tetrachloroethene (5.0 µg/L) • Vinyl chloride (2.0 µg/L) • 1,1-dichloroethene (7.0 µg/L) • 1,2-dichloroethane (70 µg/L) (ref: OU-2 ROD Section 7.2.3, page 101 and Table 7-3, page 105) DRO is not a CERCLA groundwater COC subject to the five-year review. However, the five-year review report will be revised to acknowledge the presence of DRO in groundwater, as indicated in the most recent monitoring report.		
2	Page 2	OU-5, Third bullet, Text states: "Remedial Area 1B Birch Hill Tank Farm Aboveground Storage Tanks (ASTs)" The protectiveness statement specifies: "OU-5 Remedial Area 1A (BHTF ASTs)". Please clarify. Revise where necessary.	A	Page 2, 3rd bullet under OU-5 will be changed to *"Remedial Area 1A"*.		
3	Page 14, Sec. 4.2	Text states: "a public notice will be placed in the Fairbanks Daily News Miner and the Alaska Post to announce the availability of the final five-year review" How long will the notices run in these papers?	A	A public notice was published on April 8, 2016. It ran for one day.		

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4	Page 23, Sec. 5.1.5	Text states: "the data demonstrate that migration of contaminated groundwater to the Chena River and downgradient drinking water wells is being met." Consider revising sentence to specify RAO is being met.	A	Requested change will be made.		
5	Page 23, sec. 5.1.6.1	Thirds bullet, Text states: "Groundwater analytical data indicate that groundwater contamination is attenuating, albeit at a slow rate, and the plumes are stable." For Dieldrin no trend was identified. Consider revising to list COCs that show attenuation.	A	The statement will be revised as follows: *"Analytical data indicates that groundwater contamination* <u>*due to benzene and cis 1,2-DCE is*</u> *attenuating, albeit at a slow rate, and the plumes are stable.* <u>*Aldrin, 1,1-DCE, and vinyl chloride are below their groundwater cleanup goals.*</u>*"*		
6	Page 26, Table 5-3	Table 7-3 of the ROD for OU- 2 identified DRO as a contaminant of concern for B. 1168. Please add DRO to Table 5-3.	A (with language added to the FYR report that acknowledges the presence of DRO in groundwater)	OU-2 ROD Table 7-3 identifies DRO, GRO, and BTEX as COCs for subsurface soil. It does not identify DRO as a groundwater COC. Five-year review (FYR) Table 5-3 will be revised to identify these subsurface soil COCs. FYR Table 5-4 will be revised to include the soil cleanup goals and the basis for these goals. The five-year report will also be revised to acknowledge the presence of DRO in groundwater, as indicated in the most recent monitoring report.		
7	Page 28, Sec 5.2.2.2	Text states: "When the groundwater cleanup goals were attained in 1998." DRO met cleanup goals in site wells during 2014 and 2015 groundwater monitoring. However, the groundwater DRO concentrations are still being evaluated to demonstrate	A	As noted in the response to comment 6, DRO is not a groundwater COC in the OU-2 ROD. It is not subject to the FYR. The sentence will be revised as follows, *"When groundwater cleanup*		

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		compliance with cleanup goals and the groundwater RAO. Please revise sentence. Specify which contaminants met cleanup goals.		*goals identified in the ROD were attained in 1998, …"*		
8	Page 28, Sec. 5.2.3	Text states: "The Third Five-Year Review Report (U.S. Army 1997a) provided the following protectiveness statement for the OU-2 Building 1168 Leach Well Site:" Check reference. Third Five-Year Review was dated September 2011.	A	The reference will be changed to *"(U.S. Army 2011)"*		
9	Page 30, Sec. 5.2.5	This section discusses the contaminants that are below the cleanup goals but makes no mention of the contamination above cleanup goals. Please discuss remaining contamination above the cleanup goal/cleanup level which is rationale for transfer to the 2 party program.	A	Remaining contaminants in site groundwater are not ROD COCs and not subject to the FYR. For clarity, Section 5.2.5, 1st paragraph, 2nd sentence, will be revised as follows: *"The 2015 Monitoring Report for OU-2 presents 2015 and historical groundwater analytical results and demonstrates through statistical evaluation that groundwater cleanup goals have been achieved for ROD COCs, although petroleum contamination (as DRO) persists (FES 2015m)."*		
10	Page 31, Sec. 5.2.8 & 5.2.9	Text states: "All RAOs identified in the OU-2 ROD have been attained, although petroleum contamination persists at the site." RAOs for OU-2 include 'Restore groundwater to drinking water quality" All RAOs have not been achieved if petroleum contamination is still a concern. Please revise.	A (with language added to the FYR report that acknowledges the presence of any 2-PTY Agreement contaminants in	The sentence and bullet will be revised as follows, *"All cleanup goals identified in the OU-2 ROD have been attained, although petroleum contamination persists at the site."* The five-year report will also be revised to acknowledge the presence of any 2-PTY Agreement contaminants in groundwater, as		

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			the groundwater)	indicated in the most recent monitoring report.		
11	Page 34, Sec.5.3.2 & Table 5-6	Table 7-1 of the ROD for OU- 2 identified DRO as a contaminant of concern for DRMO yard. Please add DRO to Table 5-6.	A	OU-2 ROD Table 7-1 identifies DRO as a soil COC for the DRMO Yard. It will be added to FYR Table 5-5. The soil remediation goal and basis will be added to Table 5-6.		
12	Page 34, Sec.5.3.2	Since DRO is identified as a COC in the ROD for this site, some discussion of the DRO concentrations and remediation activities should be included.	A (with language added to the FYR report that acknowledges the presence of DRO in groundwater)	As noted in the response to comment 11, DRO was identified as a soil COC in the OU-2 ROD. FYR Section 5.3.2.2 indicates that a SVE system was installed at DRMO-1 and operated to address this contaminated medium. The RPMs decided to shut down the system in 2005 due to declining PCE removal rates and concerns that it may be inhibiting anaerobic biodegradation of chlorinated compounds. Confirmation soil samples were not taken and are not available for discussion in the FYR report. The five-year report will be revised to acknowledge the presence of DRO in groundwater, as indicated in the most recent monitoring report.		
13	Page 39, Sec. 5.3.5	@ DRMO-1, Text States: "PCE - Increasing trend in well AP-10017 (up gradient) The Final 2015 Monitoring Report for OU-2 made clarification to the increasing trend. Please revise to be consistent with the approved final version of the 2015 Monitoring Report for OU-2.	A	The 2015 Monitoring Report asserts that PCE concentrations in groundwater have been sensitive to changes in groundwater levels since the second injection of an ISCR substrate. PCE increases generally correspond to groundwater level increases, which was interpreted to		

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				indicate that residual PCE may be trapped in soils. The PCE concentrations in well AP-10017 have been below the cleanup goal. The FYR report will be revised to include this information.		
14	Page 39, Sec. 5.3.5	Petroleum cleanup was part of the remedy in the ROD and needs to be included in the discussion and data review. Currently there are three monitoring wells that have DRO concentrations above the RAG. Discuss trends in the MWs.	A (with language added to the FYR report that acknowledges the presence of any 2-PTY Agreement contaminants in the groundwater)	As noted in previous responses, DRO was not identified as a groundwater COC in the OU-2 ROD. The five-year report will be revised to acknowledge the presence of any 2-PTY Agreement contaminants in groundwater, as indicated in the most recent monitoring report.		
15	Page 44, Table 5-7 & 5-8	DRO and GRO should be in the list of COCs since preventing contaminant migration from soil to groundwater is a RAO and 18 AAC 78 is an ARAR.	A	Groundwater COCs and cleanup goals identified in OU-3 ROD (Section 7.3.1, page 86) do not include DRO and GRO. The ROD does not identify COCs for soil. Rather, the remedial action goal (Section 7.3.2, page 87) is as follows: *"The remedial action goal for in situ soils contaminated with volatile organic and petroleum compounds is protection of groundwater. Because the soils are acting as a continuing source of contamination to the groundwater, active remediation of the soils will continue until Safe Drinking Water Act levels are consistently met."*		

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16	Page 48, Sec. 5.4.5	DRO needs to be discussed in this section. Since preventing contaminant migration from soil to groundwater is a RAO and 18 AAC 78 is an ARAR. DRO in the alluvial aquifer was detected above DEC cleanup level for several wells at the base of Birch Hill in 2015. Please add a discussion of DRO trends.	A (with language added to the FYR report that acknowledges the presence of DRO in groundwater)	As noted in the response to comment 15, DRO and GRO were not identified as COCs in the OU-3 ROD. The five-year report will be revised to acknowledge the presence of DRO in groundwater, as indicated in the most recent monitoring report.		
17	Page 49, Sec. 5.4.5	3rd bullet, Text states: "A measureable product (fuel) layer about 0.24-ft thick was evident in one bedrock well (AP-7848) near the base of Birch Hill" Section 1.11 of the OU-3 2015 monitoring report indicated that BHTF wells AP-7816 and AP-7848 contained 0.07 and 0.42 foot of measureable product, respectively. Should the product recovery system be reevaluated for potential restart due to rebound in the wells?	A	The 3rd bullet will be revised to reflect this new information. Product measurements at AP-7848 and other BHTF wells will be reviewed and any opportunities for optimization of the remedy will be evaluated.		
18	Page 50, 1,2 DCA	Given the increasing trends of the DCA plume in the bedrock aquifer, is MNA likely to accomplish the RAO in a reasonable amount of time? Is the current dataset sufficient to determine a timeframe for achieving the RAG? If so, please provide an estimated timeframe.	A (as amended)	The estimated timeframe to reach the cleanup goals is no more than 30 years (OU-3 ROD, Section 10.0, page 114) or by 2026. The following language will be added to the five-year review report, *"The AS/SVE remedy at Remedial Area 1B (BHTF) was implemented in 1996 and terminated in 2005. A dual-phase product recovery system was installed in 1998. Groundwater monitoring has been performed since the ROD was signed in 1996.*		

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				All ROD COCs have attenuated to below the site cleanup goals in the alluvial aquifer. COCs are still present in the bedrock aquifer above the site cleanup goals."		
19	Page 53, Sec. 5.5.1.2	Text States: "The Golden Heart Utilities and College Utilities wells are located approximately 3 and 5½ miles from the source area, respectively." Please indicate if the wells are considered down gradient of the plume.	A	The Golden Heart Utilities wells are located on the south side of the Chena River, approximately 3 miles west (down river) of OU-3 Remedial Area 2. The river separates the sites (Valve Pits and Rail Off-Loading Facility) from the Golden Heart Utilities Wells. The College Utilities wells have not been used since 2002. Reference to these wells will be removed from Section 5.5.1.2 of the five-year review report.		
20	Page 54, Table 5-9	See comment 15.	A	See response to comment 15.		
21	Page 54, Sec. 5.5.2	Please add a discussion of DRO	A (with language added to the FYR report that acknowledges the presence of DRO in groundwater)	See responses to comments 15 and 16. The five-year report will be revised to acknowledge the presence of DRO in groundwater, as indicated in the most recent monitoring report.		
22	Page 59, Sec. 5.5.5	Please add a discussion of DRO and GRO concentrations and trends. These contaminants are being addressed as part of the remedy and should be included in the 5 year review.	A (with language added to the FYR report that acknowledges	See responses to comments 15 and 16. The five-year report will be revised to acknowledge the presence of DRO		

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			the presence of DRO and GRO in groundwater)	and GRO in groundwater, as indicated in the most recent monitoring report.		
23	Page 59, Sec. 5.5.5	Text States: "Two of three Valve Pit B wells were sampled in October 2014; the third program well was severely damaged and scheduled for replacement in 2015." The well was replaced in 2015. Please update.	A	The following statement will be added, *"The damaged well (VPB-MP1) was replaced by well AP-1029MW in 2015."*		
24	Page 60, Sec.5.5.5	Text States: "COCs that have attenuated to meet the cleanup goals throughout OU-3 Remedial Area 2 include toluene, 1,2-EDB, 1,2-DCA, 1,2,4-TMB, and 1,3,5-TMB. Has DRO attenuated? Please add DRO to the discussion	A (with language added to the FYR report that acknowledges the presence of DRO in groundwater)	See previous responses related to this issue. The five-year report will be revised to acknowledge the presence of DRO in groundwater, as indicated in the most recent monitoring report.		
25	Page 60, Sec.5.5.5	Increases of DRO were also seen in the results from the high water sampling events. Please add DRO to the discussion.	A (with language added to the FYR report that acknowledges the presence of DRO in groundwater)	See previous responses related to this issue. The five-year report will be revised to acknowledge the presence of DRO in groundwater, as indicated in the most recent monitoring report.		
26	Page 64, Sec.5.6.1.2	Text States: "The Birch Hill Ski area is 1 mile to the east and has a drinking-water well completed in bedrock." Has this well been sampled and found to be unimpacted by VOCs and petroleum related compounds?	A	The Birch Hill Ski area well is completed in the Birch Creek schist aquifer. It is not hydraulically connected to the alluvial aquifer beneath the FEP Mileposts 2.7 and 3.0 sites.		

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27	Page 64, Sec.5.6.2, Tables	DRO and GRO should be in the list of COCs. Since preventing contaminant migration from soil to groundwater is a RAO and 18 AAC 78 is an ARAR.	A	~~See previous responses related to this issue.~~ Groundwater COCs and cleanup goals identified in OU-3 ROD (Section 7.3.1, page 86) do not include DRO and GRO. The ROD does not identify COCs for soil. Rather, the remedial action goal (Section 7.3.2, page 87) is as follows: *"The remedial action goal for in situ soils contaminated with volatile organic and petroleum compounds is protection of groundwater. Because the soils are acting as a continuing source of contamination to the groundwater, active remediation of the soils will continue until Safe Drinking Water Act levels are consistently met."*		
28	Page 68, Sec.5.6.5,	The 2016 data gaps analysis report identified 555 CY of contaminated soil and recommended excavation at one location near the milepost 3.0 site. The report indicates that "Contamination at MP 3.0 can be attributed to potential migration from UST-346 and associated piping as well as spills from TFS-3 and the former FEP." However, DEC considered the estimate to be low based on the fact that the proposed excavation area has not been delineated to the extent of contamination above cleanup levels. DEC has asked for additional stepout sampling to reach extents of contamination and provide a better estimate of contamination prior to the proposed removal action.	A	Comment noted. This issue will be considered in the data gap investigation that is currently under contract by the U.S. Army.		

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29	Page 72, Sec. 5.7.1.2	Text States: "The active landfill is used for disposal of construction and demolition debris" Please add: and treated soil from thermal remediation of contaminated soil is used as covering material.	A	The FWA Landfill is used primarily to receive coal ash from the Power Plant and small amounts of properly containerized friable asbestos (only) on a case-by-case basis (i.e. a pre-approved project may not estimate or generate more than 10 CY of friable asbestos for disposal at the FWA Landfill). All thermally treated soils from OIT are now deposited on the Clean Soil Stockpile across the street from the landfill.		
30	Page 73, Sec. 5.7.1.3	Please add a discussion of the pesticide containment cell, specify the quantity of pesticide contaminated soil, the levels of Dieldrin and other pesticides above applicable cleanup levels that were placed in the cell and discuss the construction of the cell and date of construction. DEC has identified this feature as needing better documentation for future Project Management. This feature (post ROD) was not addressed in the ROD for OU-4. However, the pesticide containment cell, containment cell cap and potential for migration of contaminants from the containment cell should be considered in the protectiveness statement for the site.	A	Dieldrin and other pesticides are not identified as COCs in the OU-4 ROD. The pesticide containment cell was located in the active portion of the landfill, which is not subject to the CERCLA action. Data associated with operation and closure of the cell was previously provided to ADEC.		
31	Page 79, Sec. 5.7.5	@Intermediate Zone Wells. DEC agrees with discontinuing monitoring and recommends decommissioning wells AP-6136 and AP-6138. Concentrations of all ROD listed contaminants have been below RAGs for	A	Comment noted.		

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		at least 15 consecutive sampling events over at least nine years of monitoring. Only bis (2- ethylhexyl) phthalate has been above cleanup level at these location/well. The wells indicated ND (2.2 ug/L) and ND (1.9 ug/L) respectively in the 2015 sampling event. DEC proposed CULs will revise the ADEC CUL for bis (2- ethylhexyl) phthalate to 55.6 ug/L.				
32	Page 92, Sec. 5.9.1.5	The 2002 PAH (CH2M Hill) evaluation report for WQFS in conclusions recommended NAPL seepage rate evaluations in future efforts. Given the DEC concerns for continued sheen on surface water at the Chena boom (exceedance of AWQS) and uncertainty concerning migration of contaminants from the NAPL source area, DEC recommends a seepage rate evaluation be conducted in FY 17.	D (ADEC believes, *“we don’t know if there’s a decrease in contaminant migration to the Chena River”*)	Sheen observations at individual stations along the boom are summarized in Table 3-6 of the 2015 Monitoring Report for OU-5. ~~A summary is provided below.~~ • ~~2012 – 29 observations from 26 inspections~~ • ~~2013 – 18 observations from 21 inspections~~ • ~~2014 – 3 observations from 4 inspections~~ • ~~2015 – 6 observations from 11 inspections~~ ~~The response to comment #48 provides further evidence that on-going sampling and analyses provides adequate lines of evidence to support determination of remedy protectiveness.~~ It provides evidence that NAPL migration to the river has decreased since start of the remedial action. This information will be discussed in the five-year review report.		

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33	Page 92, Sec. 5.9.2.1	Note 1, Text states: "The results confirmed the presence of PAHs and petroleum hydrocarbon sheens but no adverse impact to benthic communities was identified." However, review of the 2006 5YR indicated: The Aquatic Assessment Program found evidence that contamination from the Fort Wainwright source areas was potentially adversely influencing biotic health in the Chena River ecosystem but did not prove that sediment toxicities caused changes in the benthic invertebrate communities of the Chena River. Please revise statement to be consistent with the 2006 5YR. Also from the 2006 5YR: "The relatively low concentrations of PAHs in the 2002 Seep Area samples, relative to those collected in 1997 and 1998 may reflect scouring flood events prior to the sampling in 2002. Samples collected in 1997 and 1998 were obtained during low-flow conditions during two dry years (1997 and 1998). It is unlikely that the apparent decrease in sediment concentrations of PAHs since 1998 is due to remediation efforts in OU5."	A	Concur, the statements will be revised to be consistent with the 2006 5YR statements.		
34	Page 93, Sec. 5.9.2.2	WQFS2, Last bullet on page, Text states: "In 2013, the RPMs agreed to keep the system off for a rebound study and later decided to decommission the system when funding is available." For the 2015 OU-5 monitoring report, DEC recommended leaving the sparge curtain in place until an evaluation of contaminant migration is completed.	A (with amended language)	The requested text will be added to the five-year review report.		

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		The army responded that decommissioning of the Sparge Curtain treatment system will be delayed until data from a new monitoring well can be evaluated. Please update the text.				
35	Page 94, Sec. 5.9.2.2	Text states: "It is estimated that the AS/SVE systems collectively removed over 450,000 pounds of VOCs, as well as measurable free product on the water table." Is there a potential for further free product removal? DEC recommends reevaluating free product removal efforts.	A(with amended language)	System operations and product recovery data will be reviewed and any opportunities for optimization will be evaluated. The results will be discussed in the five-year review report (under "Question A").		
36	Page 94, Sec. 5.9.2.2	Please add recent monitoring results to the discussion. In the 2015 OU-5 Monitoring report figure 3-2 showed the monitoring well AP-10235MW has exceeded the cleanup level for DRO for the first time. This well is the closest downgradient well to the "Hot Spot" located at well AP-6946. AP-10220MW also indicated DRO above Cleanup level this sampling event Concentrations of DRO and benzene are increasing in the up gradient well AP-6946 at the "Hot Spot" location. Potentially increasing DRO concentrations were observed in sparge curtain MW AP-10235MW. Potentially increasing Benzene concentrations were observed for AP-10222.	A	Any new monitoring results that have been received since the June 2016 draft report was issued will be discussed in Section 5.9.5 (Data Review). Any new monitoring data will be reviewed and discussed in Section 5.9.5. This will include trend analysis results.		
37	Page 96, Sec. 5.9.3	**Recommendation:** Decommission the horizontal well and source area treatment systems.	A	The statement will be revised in accordance with information provided on page 95 and the response to comment 34.		

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		Progress: These systems were decommissioned in 2011. These statements are not consistent with WQFS2 statements above on Page 95. Please revise to be more specific as to what components were removed in 2011.				
38	Page 99, Sec. 5.9.6.3	Text states: "In 2014, levels of benzene and DRO in one of the monitoring wells along the Chena River (AP-10220MW) showed an increasing trend relative to previous years." Please include 2015 data in the discussion of exceedances and trends in the 5YR.	A(with amended language)	Any new monitoring results that have been received since the June 2016 draft report was issued will be discussed in the five-year review report.		
39	Page 100, Sec. 5.9.6.2	Text states: "There is also residual soil contamination present. Since the sparge curtain system was approved for decommissioning in 2013," Please see comment 34. Please add agreed response that sparge curtain will not be decommissioned prior to evaluation of contaminant migration to the Chena Boom area.	A	Requested change will be made.		
40	Page 100, Sec. 5.9.6.3	Question C, Text states: 'No other information has come to light that could call into question the protectiveness of the remedy." Is the Army considering the DEC concerns for continued migration to the Chena river boom area? Is the Army considering the 2015 exceedance of DRO at AP-10235MW and trends at the sparge curtain wells identified in the 2015 monitoring report in the protectiveness determination?	A (with recommendatio n)	Yes, see response to comment 32. The 2015 OU-5 Monitoring Report provides additional observations (weight of evidence) in Section 3.6.1 which provide evidence that the contaminant plume is not migrating to the Chena River in the Sparge Curtain treatment system area. FYR Attachment 8 concludes that the weight of evidence from the various sampling events performed in the past five years indicates that the cleanup		

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		Conference Response: Section 3.6.1 of the 2015 OU-5 Monitoring Report states that "Intermittent DRO exceedances have been observed in one well (AP-10220MW)." However, the exceedance of DRO at AP-10235MW is not mentioned or considered. It is also notable that trend analysis presented in the 2015 report shows an increasing trend for DRO at the source area well AP-6946. DRO concentrations at AP-6946 have increased by more than 2X since 2009 (from 19,000 ug/L in 2009 to 43,000 ug/L in 2015). DEC recommends pore water sampling and a seepage rate evaluation be conducted in FY 17 to provide an additional line of evidence to support the conclusion that contaminants are not migrating from the up gradient source area. Please include these recommendations in the FYR. It is noted that the Chena River Boom was not part of the remedy in the ROD.		goals and RAOs are still valid. The lines of evidence include collection of additional sediment and surface water samples from the Chena River (both discrete and passive surface water sampling), pore water samples from wells placed at the river shore, groundwater samples from monitoring wells adjacent to the river, sheen observations along the river, observations of river stage and shoreline width, and installation of a boom in the river.		
41	Page 100, Sec. 5.9.9	Text states: "The Chena River Aquatic **River** Assessment Program did not identify adverse impacts to benthic communities in the river." However, the assessment did identify adverse effects to several species within the seep area: to Chironomus (sediment test) and Ceriodaphnia (pore water test), as well as Lumbriculus. Also Please note that **River** is repeated in the sentence.	D	The CRAAP will be reevaluated to confirm/refute whether adverse impacts to benthic communities in the river were identified. Results of the reevaluation will be discussed in the five-year review report. The statement in the text will be revised to remove duplication of the word, "River", and will also be revised according to comment #33.		
42	Page 105, Sec. 5.10.2.1	Note 1, Text refers to 18 AAC Table C.	A	Requested change will be made.		

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		Please revise to: 18 AAC 75 Table C				
43	Page 105, Sec. 5.10.2.2	Text states: "The AS/SVE system began operating as a treatability study on the east side of Building 1060 in 1994. It was shut down in September 2000 when groundwater cleanup goals were achieved. The system was refurbished and moved to the west side of Building 1060 where it operated from 2000 to 2005. It was decommissioned in 2010 when groundwater cleanup goals were achieved." Have groundwater cleanup goals for DRO been achieved? This is a little confusing to state the cleanup goals were achieved in 2000 and then again in 2010. The cleanup goals were only achieved in a portion of the site in 2000. DEC recommends rewriting the paragraph to provide clarity.	A	The statement was taken from the 3rd five-year review report (Section 8.3.3), which received regulatory agency concurrences. It provides historical information on remedy implementation at the east side of Building 1060, OU-5 EQFS. DRO concentrations in groundwater at this area will be re-evaluated. The statement will be revised if the 1,500 µg/L DRO cleanup goal wasn't achieved on or immediately prior to 2000.		
44	Page 105, Sec. 5.10.2.2	The text states that "cleanup goals were achieved." 2015 data suggest that cleanup goals have not been met for DRO or Benzene.	A	We believe this comment pertains to the 3rd sentence, 1st paragraph of 5.10.2.2, which discusses operation and shut down of the AS/SVE system at the west side of Building 1060. COC concentrations in groundwater on or immediately prior to system shut down in 2005 will be re-evaluated. The statement will be revised if necessary. Note that benzene is not a COC for this site.		
45	Page 106, Sec. 5.10.3 & Figure 5-11	Recommendation: Discontinue groundwater sampling in Flowpath A, Flowpath B, Flowpath C, and the Apple Street Hot Spot wells and decommission the wells"	A	Requested change will be made.		

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		Please provide a figure that identifies the Flowpaths discussed here or revise figure 5-11.				
46	Page 107, Sec. 5.10.5	Text states:" (RRO and bis(2-chlorethyl)ether were not analyzed). When was sampling for RRO and bis(2-chlorethyl)ether discontinued? These contaminants are identified as Groundwater COCs in the ROD. However, they do not appear in the historical sampling as presented in the 2015 monitoring report for OU-5.	A	May 2015. Notes from the Winter 2015 FFA meeting document a decision to only sample the Flowpath D wells for DRO in 2015.		
47	Figure 5-8	AP-6136 is shown in red as exceeding ROD cleanup levels. However the last time this well was above RAG of 6ug/L was May 2005. It was ND (2.2 ug/L) in the last (2015) sampling event. Please revise figure.	A	The result for bis(2-Ethylhexyl) phthalate was 6.8 µg/L on October 21, 2014. The cleanup goal for this constituent is 6 µg/L.		
48	Page 108, Sec. 5.10.6.1	Text states:" Contaminant source releases to the Chena River have been reduced. Monitoring of Chena River sediments has documented that low PAH concentrations do not represent an increased ecological risk." When was the last sediment sampling event and what were the results (indicate here and in 5YR text)? Sheen was observed at the Chena River Boom in 2015. The frequency of sheen observations has been a function of water level in the Chena River at the time of monitoring and reduced sighting of sheen is not likely associated with remediation at this site.	A	~~As explained in Attachment 8, sediments along the river bank were sampled in 2012. The measured PAH levels were within the range detected during the CRAAP. The 2012 monitoring report thus concluded:~~ ~~*"The CRAAP used a comprehensive weight-of-evidence approach that included evaluating bulk sediment chemistry, bulk detritus chemistry, benthic macroinvertebrate community analysis, Chironomus tentans bioassays, and Chironomidae community analysis. The results were somewhat ambiguous with respect to contaminant impacts on the*~~		

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		Also see comment 32.		~~*biotic integrity of the Chena River, but did not suggest adverse impacts on ecosystem structure and function (ABR, Inc., and CH2M HILL, 1999). As a result, the PAH detections in sediment identified during the 2012 sampling event do not appear to represent increased ecological risk at the site."*~~ The last sampling event was performed in May and August 2015. They indicate that DRO was above the cleanup goal in two wells in May 2015 and in four wells in August 2015. GRO was below the cleanup goal in all wells and has not exceeded the cleanup goal since 2001. Benzene exceeded the cleanup goal in well AP-6946 and was below the cleanup goal in all other wells. Calculated TAH and TAqH concentrations were below the AWQS for all wells. The last sediment sampling event was performed in 2011. Analytical results were similar to results presented in the Chena River Aquatic Assessment. They are documented in the 2011 OU-5 Monitoring Report. Sheen observations in the Chena River are documented in the 2015 OU-5 Monitoring Report (Table 3-6).		

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49	Page 109 Sec. 5.10.6.3	See comment 40.	See Response Comment 40.	See response to comment 40.		
50	Page 109, Sec. 5.10.9	Text states: "Occurrences of sheen in the Chena River have decreased." See comment 48. CONFERENCE Response: The documented observations of sheen at the Chena River Boom demonstrate that AWQS are being exceeded. As noted in comment 48: The frequency of sheen observations has been a function of water level in the Chena River at the time of monitoring and reduced sighting of sheen is not likely associated with remediation at this site. The response to comment 48 indicates that the ecological risk at the site is a constant and that there is uncertainty with respect to contaminant impacts on the biotic integrity of the Chena River. Please include text in this section that states that while observations of sheen have decreased conditions in the sediment require additional monitoring. Also qualify the statement concerning the adverse impacts to benthic communities in the river to reflect the uncertainty indicated in the Chena River Aquatic Assessment.		See response to comment 32. As documented on comment 32 and 40, discussions will be included in the five year review.		
51	Page 111, Sec. 5.11.1.5	Text states:" Based on the results of the baseline risk assessment that assumed industrial use of soil, lead was identified as a COC for Remedial Area 1A." Site was moved to OU-5 from OU-3. The ROD for OU-3 area 1A specifies petroleum	A (with amended language)	According to the OU-5 ROD: • Section 5.1.4 (page 54), *"The specific reason for conducting remedial actions at Remedial Area 1A is that lead-*		

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		Hydrocarbons comingled with Lead (lead based paint) as COC in soil. Please revise.		*contaminated soils within its boundaries present a potential hazard to ecological and future human receptors if use of the land changes."* • Section 5.2.1 (page 54) [RAO for Remedial Area 1A], *"Limit human health and terrestrial receptor exposure to lead-contaminated soil (RA1A)."* • Section 7.1.7, (page 100), *"Alternative 2 [Institutional Controls] is the selected remedy under current land-use scenarios for the lead-contaminated soil in Remedial Area 1A."* The five-year review will be revised to indicate that petroleum contamination is also present in some areas.		
52	Page 112, Sec 5.11.3	Consider revising to indicate that the Lead contaminated soil removal work plan was approved and that removal actions are being implemented in 2016.	A	Requested change will be made.		
53	Page 118, Sec. 5.12.6	Additionally, the OB/OD Area was used **as for** open burn and open detonation activities and has been found to pose no unacceptable risk. Remove **as** from sentence.	A	Requested change will be made.		
54	Page 119, Sec. 5.13.1	Text states: "OU-6 previously contained or was used for barracks, company headquarters, communications and radar systems, salvage/reclamation yard activities, debris disposal, firefighter training, and.."	A	The assertion that OU-6 was previously used for firefighter training is based on a 1950's aerial photo that shows an aircraft carcass at the site. It may have been on site for salvage/reclamation and not used for		

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		DEC notes that emerging contaminants perflorinated compounds (PFCs) may be a data gap for soil and groundwater at OU-6. This could affect protectiveness of remedy.		firefighter training. The photo will be reevaluated to determine if firefighter training activities were performed at OU-6. In addition, the aircraft's location will be compared to soil excavation areas to determine if remedial actions have already been performed. Respond to comment that PFCs may be a data gap.		
55	Page 120, Sec. 5.13.1.3	Previous site activities site included Site is repeated. Please revise.	A	Requested change will be made.		
56	Figure 5-8	The figure identifies the "Phyto cell" location. The word phyto refers to plant. The use here implies a plant cell (?). This is the location of a pesticide contaminated containment cell constructed within the Landfill boundaries. Please rename the feature Pesticide containment cell.	A	The call-out on Figure 5-8 will be removed pursuant to the response to comment 30.		
57	Attachment 8, Table A8-1	Table heading shows: "ADEQ Residential VISL" Please revise to ADEC.	A	The correction to Table A.8-1 will be made.		
58	Attachment 8	It does not appear that a site specific CSM was evaluated for each operable unit. Comparison of groundwater data to VI target levels is inappropriate in certain instances where there is an unlined crawl space or significant preferential pathways. Building construction matters and if building constructed is not considered, you cannot accurately predict risk using VI target levels.	A	As part of the vapor intrusion assessment performed for this 5YR, each OU was assessed for the potential for currently occupied buildings to exist in the vicinity of groundwater plumes. Currently, the groundwater plumes have not been identified to be present in OUs 1 through 5 under actively occupied		

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		Specific factors that may result in unattenuated or enhanced transport of vapors towards a receptor, and consequently are likely to render the VISL screening target subsurface concentrations inappropriate, include: 1. Very shallow groundwater sources (for example, depths to water less than 5 ft below foundation level); 2. Shallow soil contamination vapor sources (for example, sampled at levels within a few feet of the base of the foundation) 3. Buildings with significant openings to the subsurface (for example, sumps, unlined crawlspaces, earthen floors) or significant preferential pathways, either naturally-occurring or anthropogenic (not including typical utility perforations present in most buildings). Consequently, the approach to evaluate VI risk by comparing groundwater data to vapor intrusion screening levels is inappropriate until building surveys are conducted in all the operable units to confirm the assumptions used to generate the screening levels are valid.		buildings. The screening against VISL was conducted as a conservative first step in assessing the VI pathway, as the VI pathway had not previously been assessed at these sites.		